GH Phipps CONSTRUCTION COMPANIES

o 5995 Greenwood Plaza Blvd, Suite 100
Greenwood Village, CO 80111
303-571-5377 Fax 303-629-7467

o 496 Nevada Mesa View
Colorado Springs, CO 80907
719-633-4673 Fax 719-471-3169

TRANSMITTAL

No. 11J19830037

PROJECT: PCC Center Expansion

DATE: 02/03/2012

TO: T&T Electric Co Inc
1824 Aspen Cr
Pueblo CO 81006

RE: 16000-Electrical - T&T

ATTN: Scott Smith

Ph/Fax: 719)240-0394

JOB: 11J1983

WE ARE SENDING:	SUBMITTED FOR:	ACTION TAKEN:
☐ Shop Drawings	☐ Approval	☐ Approved as Submitted
☐ Letter	☐ Your Use	☒ Approved as Noted
☐ Prints	☐ As Requested	☐ Returned After Loan
☐ Change Order	☐ Review and Comment	☐ Resubmit
☐ Plans		☐ Submit
☐ Samples	**SENT VIA:**	☐ Returned
☐ Specifications / Product Data	☐ Attached	☐ Returned for Corrections
☐ Other:	☐ Separate Cover Via:	☑ Due Date: 04/03/2012

NOTES:

Item	*Package*	*Code*	*Rev.*	*Copies*	*Date*	*Description*	*Status*
Submittal	16000	16231-01	1		02/03/2012	Packaged Engine Generators - product data	Approved As Noted
Submittal	16000	16231-02	1		02/03/2012	Packaged Engine Generators - shop drawings	Approved As Noted
Submittal	16000	16231-03	1		02/03/2012	Packaged Engine Generators - qualification data of Manufacturer	Approved As Noted

CC:

Signed: _____

Tyler Read

Shaffer Baucom
Engineering & Consulting

7333 W. Jefferson Ave.
Suite 230
Lakewood, Colorado 80235

303•986•8200 *Voice*
303•986•8222 *Facsimile*
www.sbengr.com

Letter of Transmittal

To:	Nathan Miesen, AIA	**Date:**	February 2, 2012
Company:	Oz Architecture	**From:**	Nancy White
	1805 29th St. Suite 2054	**Project Name:**	Pueblo Community College – Student Center
	Boulder, CO 80301	**SBEC #:**	110005

This Information is Being Sent Via:

☐ Regular Mail ☐ Express Mail ☐ Messenger ☒ E-Mail

Enclosed Are the Following

☐ Drawings ☐ Letter ☐ Originals ☒ Product Literature
☐ Disk(s) ☐ Specifications ☐ Change Order ☐ Attachments

Copies:	Date:	Description:
1	01-19-12	16231-01 – Packaged Engine Generators

These Are Transmitted:

☒ For Your Use ☐ After Loan To Us ☐ As Requested ☐ For Review/Comment
☐ For Approval ☐ Reviewed ☐ For Your Record ☐ _____

Remarks:

Nancy K. White

From:

Copy To: SBEC File

If enclosures are not as listed, please notify our office

P:\2011\110005 -- PCC - College Center Expansion\Submittals\Electrical\16231 - Packaged Engine Generator\16231-01, 2012.01.19\LOT Miesen, 2012.02.02.doc

Shaffer Baucom
Engineering & Consulting

7333 W. Jefferson Ave.
Suite 230
Lakewood, Colorado 80235

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303•986•8222 *Facsimile*
www.sbengr.com

Construction Submittal Review Sheet

Project Name: PCC – Student Center
Architect Log #:
SBEC#: 110005
Contractor Log #: 16231-01, 02, 03
SBEC Log # and/or submittal title: 16231-01 Packaged Engine Generators
Owner Project #:
Page: 1 OF 1
Date Received: 01-19-12

Item:	Manufacturer:	*Reviewed As Noted*	*Make Corrections Noted*	*Rejected*	*Revise and Resubmit*	*Submit Specified Item*	*Remarks*
Engine Generator	Cummins		X				1,2
Generator control system	Cummins	X					
Output circuit breaker	Square D		X				3
Battery	Deka	X					
Battery charger	SENS	X					
Remote annunciator	Cummins	X					
Drawings, wiring diagrams	Cummins	X					
Generator warranty	Cummins		X				4

Remarks:

1. Full rating of engine generator shall be available at an altitude of 6000 feet. Refer to specification section 16231, paragraph 1.6 A.
2. Remote emergency-stop switch shall be mounted outside or on the exterior of the generator housing.
3. Provide selective coordination per the NEC.
4. Warranty period shall be 5 years from the date of Substantial Completion. Refer to specification section 16231, paragraph 1.8 A.
5.
6.
7.
8.
9.

Note: *This review is only for general conformance with the design concept of the project and general compliance with the information given in the Contract Documents. Corrections or comments made concerning the shop drawing during this review do not relieve contractor from compliance with the requirements of the plans and specifications. Review of a specific item shall not include approval of an assembly of which the item is a component. Contractor is responsible for: dimensions to be confirmed and correlated at fabrication processes or to the means, methods, techniques, sequences and procedures of construction; coordination of their work with that of all other trades; and for performing all work in a safe and satisfactory manner.*

Signed (Mechanical):	Date:
Signed (Electrical): Nancy White, P.E.	Date: 02-02-12

GH Phipps CONSTRUCTION COMPANIES

o 5995 Greenwood Plaza Blvd, Suite 100
Greenwood Village, CO 80111
303-571-5377 Fax 303-629-7467

o 496 Nevada Mesa View
Colorado Springs, CO 80907
719-633-4673 Fax 719-471-3169

TRANSMITTAL

No. 11J19830001

PROJECT: PCC Center Expansion

DATE: 01/19/2012

TO: OZ Architecture of Boulder Inc
1805 29th St Ste 2054
Boulder CO 80301

RE: 16000-Electrical - T&T

ATTN: Nathan Miesen

Ph/Fax:

JOB: 11J1983

WE ARE SENDING:	SUBMITTED FOR:	ACTION TAKEN:
[X] Shop Drawings	[X] Approval	[ ] Approved as Submitted
[ ] Letter	[ ] Your Use	[ ] Approved as Noted
[ ] Prints	[ ] As Requested	[ ] Returned After Loan
[ ] Change Order	[ ] Review and Comment	[ ] Resubmit
[ ] Plans		[ ] Submit
[ ] Samples	**SENT VIA:**	[ ] Returned
[X] Specifications / Product Data	[ ] Attached	[ ] Returned for Corrections
[ ] Other:	[ ] Separate Cover Via:	[✓] Due Date: 02/02/2012

NOTES:

Item	*Package*	*Code*	*Rev.*	*Copies*	*Date*	*Description*	*Status*
Submittal	16000	16231-01	1		01/19/2012	Packaged Engine Generators - product data	Architect Review
Submittal	16000	16231-02	1		01/19/2012	Packaged Engine Generators - shop drawings	Architect Review
Submittal	16000	16231-03	1		01/19/2012	Packaged Engine Generators - qualification data	Architect Review

CC:

☐ Reviewed ☐ Make Corrections Noted
☐ Rejected ☐ Revise and Resubmit
☐ Submit Specified Item

This review is only for general conformance with the design concept of the project and general compliance with the information given in the Contract Documents. Corrections or comments made on the shop drawings during this review do not relieve contractor from compliance with the requirements of the plans and specifications. Review of a specific item shall not include approval of an assembly of which the item is a component. Contractor is responsible for: dimensions to be confirmed and correlated at the jobsite; information that pertains solely to the fabrication processes or to the means, methods, techniques, sequences and procedures of construction; coordination of their Work with that of all other trades; and for performing all work in a safe and satisfactory manner.

Shaffer • Baucom Engineering & Consulting
7333 West Jefferson Avenue, Suite 230
Lakewood, Colorado 80235 – (303) 986-8200

Date 2/2/12 By N. White

Refer to the attached
Construction Submittal
Review Sheet for comments

Signed: _____

Tyler Read

Submittal Stamp Sheet

GH Phipps Construction Companies
496 Nevada Mesa View
Colorado Springs, CO 80907

OZ Architecture of Boulder Inc
1805 29th St Ste 2054
Boulder CO 80301

Pueblo Community College
College Center Expansion

11J1983
1/19/2012

Subcontractor: T&T Electric

Spec Section:	Spec Heading:	Paragraph/ Drawing #:
16231	Packaged Engine Generators	1.4

Submitted For:
- ☑ For Approval
- ☐ Resubmittal
- ☐ For Record Only

Included:
- ☐ Samples
- ☑ Shop Drawings
- ☑ Product Data

Comments:

SUBMITTED
GH Phipps

1/19/2012

GH Phipps has reviewed, approved, and herby submits the attached in accordance with the contract documents.

Note to Subcontractor/ Material Supplier: Subcontractor/ Material Supplier remains responsible for the confirmation and correlation of dimensions at the jobsite; fabrication processes and construction techniques; coordination of the work with the work of other trades; and satisfactory performance of the work.

By: Tyler Read - Project Engineer

Rocky Mountain

Power Generation Division
8211 East 96th Avenue
Henderson, CO 80640

Project: Pueblo Community College Student Center
Contractor: T&T Electric
Submittal: #1
Date: 01/17/12

20 kW Diesel Generator Set

Sales Representative: Brian Taylor
Phone: 303-927-2248
Email: brian.d.taylor@cummins.com

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Generator Package Weight

	Weight in Pounds	Weight in Kilograms
Generator Wet Weight (oil & coolant)	1,298.00	588.76
Exhaust Silencer		0.00
Enclosure	220.00	99.79
Fuel Tank	424.00	192.32
Accessories	268.40	121.74

	Weight in Pounds	Weight in Kilograms
Total Ship Weight without Fuel	**2,210.40**	**1,002.62**

	Weight in Pounds	Weight in Kilograms
Total Pad Weight with Fuel	**3,010.40**	**1,365.49**

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Bill of Materials
Pueblo Community College Student Center
20 kW Generator Set

T&T Electric
CRM Project #63495, Revision # 0, Date 01/16/12

Line	Qty.	Description	Part Number
1		U.S. EPA, Stationary Emergency Application	Install-US-Stat
2		Genset-Diesel,60Hz,20kW-Standby Rating	20DSKBA
3		Duty Rating-Standby Power	A331-2
4		Listing-UL 2200	L090-2
5		EmissionsCertification,EPA,Nonroad,Tier4,CFR1039	L149-2
6		Enclosure-Steel,Weather Protective,with ExhSys	F182-2
7		Voltage-277/480,3 Phase,Wye,4 Wire	R002-2
8		Alternator-60Hz,12 Lead,Broad Range,105C	B256-2
9		GENSET CONTROL-POWERCOMMAND 1.1	H700-2
10		Exciter/Regulator-Torque Match	B240-2
11		Engine Governor-Electronic, Isochronous Only	A366-2
12		Display Language-English	H536-2
13		Meters-AC Output,Analog	H606-2
14		Stop Switch-Emergency	K796-2
15		Control Mounting-Front Facing	H679-2
16		Circuit Breaker Or Entrance Box-Right Side Only	KP80-2
17		CircuitBreaker-40A,Right,3P,600VAC,80%,UL	KS94-2
18		Listing, ULC-S601-07	L163-2
19		Wind Rating-150 MPH,Steel Housing	F206-2
20		Fuel Tank-Dual Wall Sub-Base, 24 Hour Min Capacity	C266-2
21		Switch-Low Fuel Level, Subbase	C157-2
22		Switch-Rupture Basin	C158-2
23		Skidbase-Housing Ready	F179-2
24		Engine Starter - 12 VDC Motor	A422-2
25		Battery Charging Alternator-Normal Output	A333-2
26		Engine Cooling-High Ambient Air Temperature	E125-2
27		Shutdown-Low Coolant Level	H389-2
28		Extension-Engine Coolant Drain	E089-2
29		Coolant Heater-120 Volt Ac, Single Phase	H036-2
30		Engine Air Cleaner-Heavy Duty	D036-2
31		Genset warranty- Base, Standby 2 years / 400 hours, Prime Powe	L028-2
32		Packing-Skid, Poly Bag	A322-2
33		Rack-Battery	F065-2
34		Extension-Oil Drain	H268-2
35		Common Parts Listing	CP01-2
36		Product Revision - B	SPEC-B

Bill of Materials
Pueblo Community College Student Center
20 kW Generator Set

T&T Electric
CRM Project #63495, Revision # 0, Date 01/16/12

Line	Qty.	Description	Part Number
37		Water Jacket Heaters, Single Phase	H036
38		**120 VAC = 1,000 Watts / 8.33 Amps**	
39			
40		**Configurable Inputs - PCC1.1 Control**	
41	1	Configurable Inputs: Warning, Shutdown, or Status Indication	
42		with Message Displayed on LCD Display	
43		Customer Input #1 - Charger AC Fail	
44		Customer Input #2 - Rupture Basin Alarm	
45			
46		**Standard Configurable Relay Outputs - PCC1.1 Control**	
47	1	Configurable Relay Outputs:	
48		**2 Amp @ 30 VDC / 3 Amp @ 120 VAC**	
49		Relay Output #1 - Common Alarm, Warning Faults	
50		Relay Output #2 - Common Alarm, Shutdown Faults	
51			
52		**Remote Annunciator-PCCnet Network RS485**	
53	1	Cummins Remote PCCnet Network Annunciator Panel-	0300-5929-02
54		20 Light, RS485, Flush/Surface NEMA Type 1 Enclosure	
55		Cust. Fault #1 - Spare	
56		Cust. Fault #2 - Spare	
57		Cust. Fault #3 - Rupture Basin Alarm	
58		Contractor Note: PCCnet RS485 Cabling Requirements.	
59		Requires Twin Power Conductors, Stranded Twisted Pair,	
60		Shielded Network Data Cable. (Belden 9729)	
61		**Installation By Electrical Contractor**	
62		**NFPA110**	
63			
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Bill of Materials
Pueblo Community College Student Center
20 kW Generator Set

T&T Electric
CRM Project #63495, Revision # 0, Date 01/16/12

Line	Qty.	Description	Part Number
71		**KS94/150 Amp H-Frame/40 Amp Trip (Main Line Circuit Breaker)**	
72	1	Cummins/Square D Local Main Line Circuit Breaker	KS94
73		Ref. Square D Catalog #0611CT0401R7/05	
74		Square D/PowerPact 150 Amp HG-Frame/40 Amp Trip	
75		UL Listed, 3-Pole, 80% Rated	
76		Interrupting Rating 65 kA @ 240 VAC	
77		Interrupting Rating 35 kA @ 480 VAC	
78		Molded Case, Thermo-Magnetic Trip Unit	
79		NEMA Type 1 Enclosure	
80		Full Neutral Bus & Ground Bond	
81		Mechanical Lugs: (1) #14 AWG-3/0 AWG AL or CU Per Phase	
82		**(Mounted Right Side Of The Control Panel)**	
83			
84		**Cummins Engine Coolant & Lube Oil**	
85	1-Lot	Initial Fill of Engine Coolant, Ethylene Glycol	50/50
86			
87	1-Lot	Initial Fill of Lube Oil, Cummins Blue	15W/40
88			
89		**Cummins Factory Testing**	
90	1	Cummins Typical Generator Set Production Test	CPG TGSPT
91			
92		**Cummins Generator Set Warranty**	
93	1	Warranty: 2-Year Base Warranty - Emergency Standby Power	L028
94		From Initial Date Of Start-Up	
95			
96		**Engine Starting Batteries**	
97	1	Engine Starting Battery, Group 31 Lead/Acid Type	1131XPMF
98		12 VDC, Maintenance Free	
99			
100		**Engine Starting Batteries Warming Pads**	
101	1	Battery Warming Pad, 120 VAC, 60 Watt	BH4
102	1	Thermostat, On at 40^{o}F, Off at 60^{o}F	DIT46
103			
104			

Bill of Materials
Pueblo Community College Student Center
20 kW Generator Set

T&T Electric
CRM Project #63495, Revision # 0, Date 01/16/12

Line	Qty.	Description	Part Number
105		**SENS 10 Amp Battery Charging System**	
106	1	SENS EnerGenius Battery Charger, NFPA-110 Alarms	NRG22-10-RC
107		10 Amp @ 12/24 VDC Output, 60HZ-120/208-240 VAC Input	
108			
109		**F182 - Steel UL2200 Listed Weather Protective Enclosure**	
110	1	Steel Weather Protective Enclosure Package	F182
111		Compliant with UL2200 Listed Gensets	
112		NEC Compliant	
113		Sound Levels @ 7 Meters = 82.4 dB(A)	
114		(When Tested In A Free Field Environment)	
115		Drop-Over Style - With Or Without Fuel Tank	
116		Internally Mounted Exhaust Silencer W/ Rain Cap	
117		14 Gauge (Panels) 12 Gauge (Posts) Steel Construction	
118		Three Hinged, Recessed, Key Lockable Doors	
119		Fixed Louvers Air-Inlet	
120		Radiator Air-Discharge-With Screened Outlet	
121		Corrosion Resistant Hardware	
122		Cambered Roof	
123		Easy Access Lifting Points	
124	1	Optional-Wind Rated To 150mph - Steel Enclosure	F206
125	1	All Electrical Wired To Terminal Strip Located Inside-	
126		The Circuit Breaker Can	
127		Double E-Coat Paint - Onan Green	
128			
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137			
138			

Bill of Materials
Pueblo Community College Student Center
20 kW Generator Set

T&T Electric
CRM Project #63495, Revision # 0, Date 01/16/12

Line	Qty.	Description	Part Number
139		**100 Gallon Fuel Tank-C266**	
140	1	Cummins Double Wall Base Fuel Tank	C266
141		Fuel Tank Capacity: 100 Gallon	
142		Engine Supply & Return Connections	
143		Sight Fuel Level Gauge	
144		Normal and Emergency Vents Per UL	
145		2" Lockable Fuel Fill, Sight Fuel Level Gauge	
146		Onan Green Paint	
147	1	Listing - ULC-S601-07	L163
148	1	Low Level Float Switch & Alarm, 22.5% Fuel Level	C157
149	1	Warning-Fuel In Rupture Basin	C158
150	1	Normal Vent Extension - 12 Feet Above Finished Grade	2" Vent Extension
151			
152		**Overfill Prevention Valve**	
153	1	9095S-Overfill Prevention Valve-Set @ 78.38% - Morrison Bros.	9095S-0200 AV
154	1	2" Camlock Locking Cap - Morrison Bros.	305C
155	1	2" NPT Black Pipe Nipple X 2" Long-OFPV Mounting	BN2.X2.
156			
157		**CRM On-Site Testing**	
158	1	CRM Site Tests:	4-Hour Load Test
159		4-Hour Load Test With CRM Resistive Load Bank	
160			
161		**DSKAB O&M Manual**	
162	4	Operator's & Maintenance Manuals - DSKAB	0998-0098
163			
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Diesel generator set V2203-M series engine EPA emissions

> Specification sheet
20 kW 60 Hz

Our energy working for you.™

Cummins Power Generation

Description

Cummins Power Generation commercial generator sets are fully integrated power generation systems providing optimum performance, reliability and versatility for stationary standby and prime power applications. Codes or standards compliance may not be available with all model configurations – consult factory for availability.

ISO 9001	This generator set is designed in facilities certified to ISO 9001 and manufactured in facilities certified to ISO 9001 or ISO 9002.
PTS	The Prototype Test Support (PTS) program verifies the performance integrity of the generator set design. Cummins Power Generation products bearing the PTS symbol meet the prototype test requirements of NFPA 110 for Level 1 systems.
CSA	All low voltage models are CSA certified to product class 4215-01.
UL	The generator set is available Listed to UL2200, Stationary Engine Generator Assemblies.
U.S. EPA	Engine certified to U.S. EPA Nonroad Source Emissions Standards, 40 CFR 1039, Tier 4.

Features

Kubota heavy-duty engine - Rugged 4-cycle, liquid-cooled, industrial diesel delivers reliable power, low emissions and fast response to load changes.

Alternator - Several alternator sizes offer selectable motor starting capability with low reactance 2/3 pitch windings, low waveform distortion with non-linear loads and fault clearing short-circuit capability.

Control system - The PowerCommand® 1.1 electronic control is standard equipment and provides total genset system integration including automatic remote starting/stopping, precise frequency and voltage regulation, alarm and status message display, output metering, auto-shutdown at fault detection and NFPA 110 Level 1 compliance.

Cooling system - Standard integral set-mounted radiator system, designed and tested for rated ambient temperatures, simplifies facility design requirements for rejected heat.

Enclosures - Optional weather protective and sound attenuated enclosures are available.

Fuel tanks - Dual wall sub-base fuel tanks are also available.

NFPA - The genset accepts full rated load in a single step in accordance with NFPA 110 for Level 1 systems.

Warranty and service - Backed by a comprehensive warranty and worldwide distributor network.

	Standby rating		Prime rating		Continuous rating		Data sheets	
Model	60 Hz kW (kVA)	50 Hz kW (kVA)	60 Hz kW (kVA)	50 Hz kW (kVA)	60 Hz kW (kVA)	50 Hz kW (kVA)	60 Hz	50 Hz
DSKBA	20 (25)		~~18.2 (22.7)~~				D-3373	

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S-1562d (5/11)

Generator set specifications

Governor regulation class	
Voltage regulation, no load to full load	± 1%
Random voltage variation	± 1%
Frequency regulation	Isochronous
Random frequency variation	± 0.25%
Radio frequency emissions compliance	

Engine specifications

Bore	87.0 mm (3.43 in)
Stroke	92.4 mm (3.64 in)
Displacement	2.20 litres (134.1 in^3)
Configuration	Cast iron, in-line, 4 cylinder
Battery capacity	350 amps minimum at ambient temperature of -18 °C to 0 °C (0 °F to 32 °F)
Battery charging alternator	40 amps
Starting voltage	12 volt, negative ground
Fuel system	Indirect injection: low or ultra low sulfur, number 2 diesel fuel
Fuel filter	Single element, spin-on fuel filter with water separator
Air cleaner type	Dry replaceable element
Lube oil filter type(s)	Spin-on, full flow
Standard cooling system	High ambient radiator

Alternator specifications

Design	Brushless, 4 pole, drip proof revolving field
Stator	2/3 pitch
Rotor	Single bearing, flexible discs
Insulation system	Class H
Standard temperature rise	125 ºC standby at 40 ºC ambient
Exciter type	Torque match (shunt)
Phase rotation	A (U), B (V), C (W)
Alternator cooling	Direct drive centrifugal blower fan
AC waveform total harmonic distortion	< 7% no load to full linear load, < 3% for any single harmonic
Telephone influence factor (TIF)	< 40 per NEMA MG1-22.43
Telephone harmonic factor (THF)	< 3

Available voltages

60 Hz Three phase line-neutral/line-line				60 Hz Single phase line-neutral/line-line
· 120/208	· 139/240	· 240/416	· 347/600	· 120/240
· 120/240 Delta	· 220/380	· 277/480		

* Note: Consult factory for other voltages.

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www.cumminspower.com

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S-1562d (5/11)

Power Generation

Control system PCC 1302

PowerCommand control is an integrated generator set control system providing voltage regulation, engine protection, operator interface and isochronous governing (optional). Major features include:

- Battery monitoring and testing features and smart starting control system.
- Standard PCCNet interface to devices such as remote annunciator for NFPA 110 applications.
- Control boards potted for environmental protection.
- Control suitable for operation in ambient temperatures from -40 °C to +70 °C (-40 °F to +158 °F) and altitudes to 5000 meters (13,000 feet).
- Prototype tested; UL, CSA, and CE compliant.
- InPower™ PC-based service tool available for detailed diagnostics.

Operator/display panel

- Manual off switch
- Alpha-numeric display with pushbutton access for viewing engine and alternator data and providing setup, controls and adjustments (English or international symbols)
- LED lamps indicating genset running, not in auto, common warning, common shutdown, manual run mode and remote start
- Suitable for operation in ambient temperatures from -20 °C to +70 °C
- Bargraph display (optional)

AC protection

- Over current warning and shutdown
- Over and under voltage shutdown
- Over and under frequency shutdown
- Over excitation (loss of sensing) fault
- Field overload

Engine protection

- Overspeed shutdown
- Low oil pressure warning and shutdown
- High coolant temperature warning and shutdown
- Low coolant level warning or shutdown
- Low coolant temperature warning
- High, low and weak battery voltage warning
- Fail to start (overcrank) shutdown
- Fail to crank shutdown
- Redundant start disconnect
- Cranking lockout
- Sensor failure indication
- Low fuel level warning or shutdown
- Fuel-in-rupture-basin warning or shutdown

Alternator data

- Line-to-line and Line-to-neutral AC volts
- 3-phase AC current
- Frequency
- Total kVa

Engine data

- DC voltage
- Lube oil pressure
- Coolant temperature
- Engine speed

Other data

- Genset model data
- Start attempts, starts, running hours
- Fault history
- RS485 Modbus® interface
- Data logging and fault simulation (requires InPower service tool)

Digital governing (optional)

- Integrated digital electronic isochronous governor
- Temperature dynamic governing

Digital voltage regulation

- Integrated digital electronic voltage regulator
- 2-phase line-to-line sensing
- Configurable torque matching

Control functions

- Time delay start and cooldown
- Cycle cranking
- PCCNet interface
- (2) Configurable inputs
- (2) Configurable outputs
- Remote emergency stop
- Glow plug control (some models)

For further detail see document S-1531.

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www.cumminspower.com

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S-1562d (5/11)

Power Generation

Ratings definitions

Emergency standby power (ESP):

Applicable for supplying power to varying electrical load for the duration of power interruption of a reliable utility source. Emergency Standby Power (ESP) is in accordance with ISO 8528. Fuel Stop power in accordance with ISO 3046, AS 2789, DIN 6271 and BS 5514.

Limited-time running power (LTP):

Applicable for supplying power to a constant electrical load for limited hours. Limited Time Running Power (LTP) is in accordance with ISO 8528.

Prime power (PRP):

Applicable for supplying power to varying electrical load for unlimited hours. Prime Power (PRP) is in accordance with ISO 8528. Ten percent overload capability is available in accordance with ISO 3046, AS 2789, DIN 6271 and BS 5514.

Base load (continuous) power (COP):

Applicable for supplying power continuously to a constant electrical load for unlimited hours. Continuous Power (COP) in accordance with ISO 8528, ISO 3046, AS 2789, DIN 6271 and BS 5514.

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1400 73rd Avenue N.E.
Minneapolis, MN 55432 USA
Telephone: 763 574 5000
Fax: 763 574 5298

Warning: Back feed to a utility system can cause electrocution and/or property damage. Do not connect to any building's electrical system except through an approved device or after building main switch is open.

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S-1562d (5/11)

Model: DSKBA
Frequency: 60
Fuel type: Diesel
KW rating: 20 standby
18.2 prime
Emissions level: EPA Nonroad Tier 4

Generator set data sheet

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Exhaust emission data sheet:	**EDS-1095**
Exhaust emission compliance sheet:	**EPA-1129**
Sound performance data sheet:	**MSP-1075**
Cooling performance data sheet:	**MCP-182**
Prototype test summary data sheet:	**PTS-289**
Standard set-mounted radiator cooling outline:	**500-4864**
Optional set-mounted radiator cooling outline:	
Optional heat exchanger cooling outline:	
Optional remote radiator cooling outline:	

Fuel consumption

	Standby kW (kVA)				Prime kW (kVA)				Continuous kW (kVA)
Ratings	20 (25)				18.2 (22.7)				
Load	**1/4**	**1/2**	**3/4**	**Full**	**1/4**	**1/2**	**3/4**	**Full**	**Full**
US gph	0.48	0.97	1.45	1.93	0.44	0.89	1.33	1.77	
L/hr	1.8	3.7	5.5	7.3	1.7	3.4	5.0	6.7	

Engine

	Standby rating	Prime rating	Continuous rating
Engine manufacturer	Kubota		
Engine model	V2203M		
Configuration	Cast iron, in-line, 4 cylinder		
Aspiration	Natural		
Gross engine power output, kWm (bhp)	27.7 (37.1)	~~25.2 (33.8)~~	
BMEP at set rated load, kPa (psi)	737.7 (107.0)	~~668.8 (97.0)~~	
Bore, mm (in)	87 (3.43)		
Stroke, mm (in)	92.4 (3.64)		
Rated speed, rpm	1800		
Piston speed, m/s (ft/min)	5.5 (1091.0)		
Compression ratio	23.0:1		
Lube oil capacity, L (qt)	9.5 (10.0)		
Overspeed limit, rpm	2100		
Regenerative power, kW	7.0		

Fuel flow

Maximum fuel flow, L/hr (U.S. gph)	13.4 (3.5)	
Maximum fuel flow with C174, L/hr (U.S. gph)		
Maximum fuel inlet restriction with clean filter, mm Hg (in Hg)	51 (2)	
Maximum return restriction, mm Hg (in Hg)	152 (6)	

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Air	Standby rating	Prime rating	Continuous rating
Combustion air, m^3/min (scfm)	1.7 (61)	~~TBD~~	
Maximum air cleaner restriction with clean filter, kPa (in H_2O)	3.7 (15)		
Alternator cooling air, m^3/min (cfm)	7.1 (250)		

Exhaust			
Exhaust flow at set rated load, m^3/min (cfm)	4.9 (174)	~~4.6 (163)~~	
Exhaust temperature, °C (°F)	521 (970)	~~472 (882)~~	
Maximum back pressure, kPa (in H_2O)	10 (40)		

Standard set-mounted radiator cooling			
Ambient design, °C (°F)	55 (131)		
Fan load, kW_m (HP)	1.2 (1.6)	~~1.2 (1.6)~~	
Coolant capacity (with radiator), L (U.S. Gal)	7.7 (2.0)	~~7.7 (2.0)~~	
Cooling system air flow, m^3/min (scfm)	63 (2222)	~~63 (2222)~~	
Total heat rejection, MJ/min (Btu/min)	1.85 (1751)	~~1.73 (1616)~~	
Maximum cooling air flow static restriction, kPa (in H_2O)	0.12 (0.5)		

Optional set-mounted radiator cooling			
Ambient design, °C (°F)			
Fan load, kW_m (HP)			
Coolant capacity (with radiator), L (U.S. Gal)			
Cooling system air flow, m^3/min (scfm)			
Total heat rejection, MJ/min (Btu/min)			
Maximum cooling air flow static restriction, kPa (in H_2O)			

Optional heat exchanger cooling			
Set coolant capacity, L (U.S. Gal.)			
Heat rejected, jacket water circuit, MJ/min (Btu/min)			
Heat rejected, aftercooler circuit, MJ/min (Btu/min)			
Heat rejected, fuel circuit, MJ/min (Btu/min)			
Total heat radiated to room, MJ/min (Btu/min)			
Maximum raw water pressure, jacket water circuit, kPa (psi)			
Maximum raw water pressure, aftercooler circuit, kPa (psi)			
Maximum raw water pressure, fuel circuit, kPa (psi)			
Maximum raw water flow, jacket water circuit, L/min (U.S. Gal/min)			
Maximum raw water flow, aftercooler circuit, L/min (U.S. Gal/min)			
Maximum raw water flow, fuel circuit, L/min (U.S. Gal/min)			
Minimum raw water flow at 27 °C (80 °F) inlet temp, jacket water circuit, L/min (U.S. Gal/min)			
Minimum raw water flow at 27 °C (80 °F) inlet temp, aftercooler circuit, L/min (U.S. Gal/min)			
Minimum raw water flow at 27 °C (80 °F) inlet temp, fuel circuit, L/min (U.S. Gal/min)			
Raw water delta P at min flow, jacket water circuit, kPa (psi)			
Raw water delta P at min flow, aftercooler circuit, kPa (psi)			
Raw water delta P at min flow, fuel circuit, kPa (psi)			
Maximum jacket water outlet temp, °C (°F)			
Maximum aftercooler inlet temp, °C (°F)			
Maximum aftercooler inlet temp at 25 °C (77 °F) ambient, °C (°F)			

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Optional remote radiator cooling[1]	Standby rating	Prime rating	Continuous rating
Set coolant capacity, L (US gal)			
Max flow rate at max friction head, jacket water circuit, L/min (US gal/min)			
Max flow rate at max friction head, aftercooler circuit, L/min (US gal/min)			
Heat rejected, jacket water circuit, MJ/min (Btu/min)			
Heat rejected, aftercooler circuit, MJ/min (Btu/min)			
Heat rejected, fuel circuit, MJ/min (Btu/min)			
Total heat radiated to room, MJ/min (Btu/min)			
Maximum friction head, jacket water circuit, kPa (psi)			
Maximum friction head, aftercooler circuit, kPa (psi)			
Maximum static head, jacket water circuit, m (ft)			
Maximum static head, aftercooler circuit, m (ft)			
Maximum jacket water outlet temp, °C (°F)			
Maximum aftercooler inlet temp at 25 °C (77 °F) ambient, °C (°F)			
Maximum aftercooler inlet temp, °C (°F)			
Maximum fuel flow, L/hr (US gph)			
Maximum fuel return line restriction, kPa (in Hg)			

Derating factors

Standby	Engine power available up to 900 m (3000 ft) at ambient temperature up to 25 °C (77 °F). Consult your Cummins Power Generation distributor for temperature and ambient requirements outside these parameters.
Prime	~~Engine power available up to 1100 m (3600 ft) at ambient temperature up to 25 °C (77 °F). Consult your Cummins Power Generation distributor for temperature and ambient requirements outside these parameters.~~
Continuous	

Ratings definitions

Emergency standby power (ESP):	Limited-time running power (LTP):	Prime power (PRP):	Base load (continuous) power (COP):
Applicable for supplying power to varying electrical load for the duration of power interruption of a reliable utility source. Emergency Standby Power (ESP) is in accordance with ISO 8528. Fuel Stop power in accordance with ISO 3046, AS 2789, DIN 6271 and BS 5514.	Applicable for supplying power to a constant electrical load for limited hours. Limited Time Running Power (LTP) is in accordance with ISO 8528.	Applicable for supplying power to varying electrical load for unlimited hours. Prime Power (PRP) is in accordance with ISO 8528. Ten percent overload capability is available in accordance with ISO 3046, AS 2789, DIN 6271 and BS 5514.	Applicable for supplying power continuously to a constant electrical load for unlimited hours. Continuous Power (COP) is in accordance with ISO 8528, ISO 3046, AS 2789, DIN 6271 and BS 5514.

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Alternator data

Three phase table[1]		**80 °C**	**80 °C**	**80 °C**	**80 °C**	**105 °C**	**105 °C**	**105 °C**	**105 °C**	**125 °C**	**125 °C**	**125 °C**	**125 °C**
Feature code		B257	B269	B386	B305	B256	B268	B385	B304	B255	B267	B384	B303
Voltage ranges		120/208 Thru 139/240 240/416 Thru 277/480	120/208 Thru 139/240 240/416 Thru 277/480	220/380	347/600	120/208 Thru 139/240 240/416 Thru 277/480	120/208 Thru 139/240 240/416 Thru 277/480	220/380	347/600	120/208 Thru 139/240 240/416 Thru 277/480	120/208 Thru 139/240 240/416 Thru 277/480	220/380	347/600
Surge kW		21	21	21	21	21	21	21	21	21	21	21	21
Motor starting kVA (at 90% sustained voltage)	Shunt	120	120	102	102	120	120	84	84	120	120	84	84

Full load current - amps at standby rating	120/208	139/240	220/380	240/416	277/480	347/600
	69	60	38	35	30	24

Single phase table		**80 °C**	**80 °C**	**80 °C**	**105 °C**	**105 °C**	**105 °C**	**125 °C**	**125 °C**	**125 °C**			
Feature code		B275	B257	B269	B274	B256	B268	B273	B255	B267			
Voltage ranges		120/240[3]	120/240[2]	120/240[3]	120/240[3]	120/240[2]	120/240[3]	120/240[3]	120/240[2]	120/240[3]			
Surge kW		22	21	21	22	21	21	22	21	21			
Motor starting kVA (at 90% sustained voltage)	Shunt	87	87	87	87	87	87	87	87	87			

Full Load Current - Amps at standby rating	120/240[12]	120/240[3]
	56	83

[1] Single phase power can be taken from a three phase generator set at up to 2/3 set rated 3-phase kW at 1.0 power factor. Also see Note 3 below.
[2] The broad range alternators can supply single phase output up to 2/3 set rated 3-phase kW at 1.0 power factor.
[3] The extended stack (full single phase output) and 4 lead alternators can supply single phase output up to full set rated 3-phase kW at 1.0 power factor.

Formulas for calculating full load currents:

Three phase output

$$\frac{kW \times 1000}{Voltage \times 1.73 \times 0.8}$$

Single phase output

$$\frac{kW \times Single\ Phase\ Factor \times 1000}{Voltage}$$

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PowerCommand®
1.1 control system

> Specification sheet

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Control system description

The PowerCommand® control system is a microprocessor-based generator set monitoring, metering and control system designed to meet the demands of today's engine driven generator sets. The integration of all control functions into a single control system provides enhanced reliability and performance compared to conventional generator set control systems. These control systems have been designed and tested to meet the harsh environment in which gensets are typically applied.

Features

- 128 x 64 pixels graphic LED backlight LCD.
- Digital voltage regulation. Single phase full wave SCR type regulator compatible with either shunt or PMG systems.
- Digital engine speed governing (where applicable).
- Generator set monitoring and protection.
- Advanced overcurrent protection.
- Modbus® interface for interconnecting to customer equipment.
- 12 and 24 VDC battery operation.
- Warranty and service. Backed by a comprehensive warranty and worldwide distributor service network.
- Certification. Suitable for use on generator sets that are designed, manufactured, tested and certified to relevant UL, NFPA, ISO, IEC Mil Std., CE and CSA standards.

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PowerCommand digital generator set control PCC 1302

Description

The PowerCommand generator set control is suitable for use on a wide range of generator sets in non-paralleling applications. The PowerCommand control is compatible with shunt or PMG excitation style. It is suitable for use with reconnectable or non-reconnectable generators, and it can be configured for any frequency, voltage and power connection from 120-600 VAC line-to-line.

Power for this control system is derived from the generator set starting batteries. The control functions over a voltage range from 8 VDC to 30 VDC.

Features

- 12 and 24 VDC battery operation.
- Digital voltage regulation - Single phase full wave SCR type regulator compatible with either shunt or PMG systems. Sensing is single phase.
- Digital engine speed governing (where applicable) - Provides isochronous frequency regulation.
- Full authority engine communications (where applicable) - Provides communication and control with the Engine Control Module (ECM).
- Common harnessing - with higher feature Cummins Power Generation controls allows for easy field upgrades.
- Generator set monitoring - Monitors status of all critical engine and alternator functions.
- Digital genset metering (AC and DC).
- Genset battery monitoring system - to sense and warn against a weak battery condition.
- Engine starting - Includes relay drivers for starter, fuel shut off (FSO), glow plug/spark ignition power and switch B+ applications.
- Generator set protection - Protects engine and alternator.
- Advanced serviceability - using InPower™, a PC-based software service tool.
- Environmental protection - The control system is designed for reliable operation in harsh environments. The main control board is a fully encapsulated module that is protected from the elements.
- Modbus interface - for interconnecting to customer equipment.
- Configurable inputs and outputs - Four discrete inputs and two dry contact relay outputs.
- Warranty and service - Backed by a comprehensive warranty and worldwide distributor service network.
- Certifications - Suitable for use on generator sets that are designed, manufactured, tested and certified to relevant UL, NFPA, ISO, IEC, Mil Std., CE and CSA standards.

Base control functions

HMI capability

Operator adjustments - The HMI includes provisions for many set up and adjustment functions.

Generator set hardware data - Access to the control and software part number, generator set rating in KVA and generator set model number is provided from the HMI or InPower.

Data logs - Includes engine run time, controller on time, number of start attempts.

Fault history - Provides a record of the most recent fault conditions with control hours time stamp. Up to 10 events are stored in the control non-volatile memory.

Alternator data

- Voltage (single or three phase line-to-line and line-to-neutral)
- Current (single or three phase)
- KVA (three phase and total)
- Frequency

Engine data

- Starting battery voltage
- Engine speed
- Engine temperature
- Engine oil pressure
- Partial Full Authority Engine (FAE) data (where applicable)

Service adjustments - The HMI includes provisions for adjustment and calibration of generator set control functions. Adjustments are protected by a password. Functions include:

- Engine speed governor adjustments
- Voltage regulation adjustments
- Cycle cranking
- Configurable fault set up
- Configurable output set up
- Meter calibration
- Units of measurement

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Engine control

SAE-J1939 CAN interface to full authority ECMs (where applicable) - Provides data swapping between genset and engine controller for control, metering and diagnostics.

12 VDC/24 VDC battery operations - PowerCommand will operate either on 12 VDC or 24 VDC batteries.

Isochronous governing (where applicable) - Capable of controlling engine speed within +/-0.25% for any steady state load from no load to full load. Frequency drift will not exceed +/-0.5% for a 33 °C (60 °F) change in ambient temperature over an 8 hour period.

Temperature dependent governing dynamics (with electronic governing) - Modifies the engine governing control parameters as a function of engine temperature. This allows the engine to be more responsive when warm and more stable when operating at lower temperature levels.

Remote start mode - Accepts a ground signal from remote devices to automatically start the generator set and immediately accelerate to rated speed and voltage. The remote start signal will also wake up the control from sleep mode. The control can incorporate a time delay start and stop.

Remote and local emergency stop - The control accepts a ground signal from a local (genset mounted) or remote (facility mounted) emergency stop switch to cause the generator set to immediately shut down. The generator set is prevented from running or cranking with the switch engaged. If in sleep mode, activation of either emergency stop switch will wake up the control.

Sleep mode - The control includes a configurable low current draw state to minimize starting battery current draw when the genset is not operating. The control can also be configured to go into a low current state while in auto for prime applications or applications without a battery charger.

Engine starting - The control system supports automatic engine starting. Primary and backup start disconnects are achieved by one of three methods: magnetic pickup, battery charging alternator feedback or main alternator output frequency. The control also supports configurable glow plug control when applicable.

Cycle cranking - Configurable for the number of starting cycles (1 to 7) and duration of crank and rest periods. Control includes starter protection algorithms to prevent the operator from specifying a starting sequence that might be damaging.

Time delay start and stop (cooldown) - Configurable for time delay of 0-300 seconds prior to starting after receiving a remote start signal and for time delay of 0-600 seconds prior to shut down after signal to stop in normal operation modes. Default for both time delay periods is 0 seconds.

Alternator control

The control includes an integrated line-to-line sensing voltage regulation system that is compatible with shunt or PMG excitation systems. The voltage regulation system is full wave rectified and has an SCR output for good motor starting capability. Major system features include:

Digital output voltage regulation - Capable of regulating output voltage to within +/-1.0% for any loads between no load and full load. Voltage drift will not exceed +/-1.5% for a 40 ºC (104 ºF) change in temperature in an eight hour period. On engine starting or sudden load acceptance, voltage is controlled to a maximum of 5% overshoot over nominal level.

The automatic voltage regulator feature can be disabled to allow the use of an external voltage regulator.

Torque-matched V/Hz overload control - The voltage roll-off set point and rate of decay (i.e. the slope of the V/Hz curve) is adjustable in the control.

Protective functions

On operation of a protective function the control will indicate a fault by illuminating the appropriate status LED on the HMI, as well as display the fault code and fault description on the LCD. The nature of the fault and time of occurrence are logged in the control. The service manual and InPower service tool provide service keys and procedures based on the service codes provided. Protective functions include:

Battle short mode

When enabled and the *battle short* switch is active, the control will allow some shutdown faults to be bypassed. If a bypassed shutdown fault occurs, the fault code and description will still be annunciated, but the genset will not shutdown. This will be followed by a *fail to shutdown fault*. Emergency stop shutdowns and others that are critical for proper operation are not bypassed. Please refer to the Control Application Guide or Manual for list of these faults.

Configurable alarm and status inputs

The control accepts up to four alarm or status inputs (configurable contact closed to ground or open) to indicate a configurable (customer-specified) condition. The control is programmable for warning, shutdown or status indication and for labeling the input.

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Emergency stop

Annunciated whenever either emergency stop signal is received from external switch.

Hydro mechanical fuel system engine protection

Overspeed shutdown - Default setting is 115% of nominal.

Low lube oil pressure warning/shutdown - Level is preset (configurable with InPower) to match the capabilities of the engine used. Control includes time delays to prevent nuisance shutdown signals.

High lube oil temperature warning/shutdown - Level is preset (configurable with InPower) to match the capabilities of the engine used. Control includes time delays to prevent nuisance shutdown signals.

High engine temperature warning/shutdown - Level is preset (configurable with InPower) to match the capabilities of the engine used. Control includes time delays to prevent nuisance shutdown signals.

Low coolant temperature warning – Indicates that engine temperature may not be high enough for a 10 second start or proper load acceptance.

Sensor failure indication - Logic is provided on the base control to detect analog sensor or interconnecting wiring failures.

Full authority electronic engine protection

Engine fault detection is handled inside the engine ECM. Fault information is communicated via the SAE-J1939 data link for annunciation in the HMI.

General engine protection

Low and high battery voltage warning - Indicates status of battery charging system (failure) by continuously monitoring battery voltage.

Weak battery warning - The control system will test the battery each time the generator set is signaled to start and indicate a warning if the battery indicates impending failure.

Fail to start (overcrank) shutdown - The control system will indicate a fault if the generator set fails to start by the completion of the engine crack sequence.

Fail to crank shutdown - Control has signaled starter to crank engine but engine does not rotate.

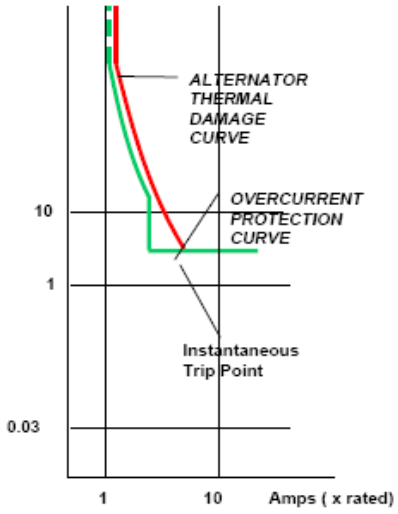
Cranking lockout - The control will not allow the starter to attempt to engage or to crank the engine when the engine is rotating.

Alternator protection

High AC voltage shutdown (59) - Output voltage on any phase exceeds preset values. Time to trip is inversely proportional to amount above threshold. Values adjustable from 105-130% of nominal voltage, with time delay adjustable from 0.1-10 seconds. Default value is 110% for 10 seconds.

Low AC voltage shutdown (27) - Voltage on any phase has dropped below a preset value. Adjustable over a range of 50-95% of reference voltage, time delay 2-20 seconds. Default value is 85% for 10 seconds.

Overcurrent warning/shutdown - Implementation of the thermal damage curve with instantaneous trip level calculated based on current transformer ratio and application power rating.



Under frequency shutdown (81 u) - Generator set output frequency cannot be maintained. Settings are adjustable from 2-10 Hz below nominal governor set point, for a 5-20 second time delay. Default: 6 Hz, 10 seconds.

Over frequency shutdown/warning (81o) - Generator set is operating at a potentially damaging frequency level. Settings are adjustable from 2-10 Hz above nominal governor set point for a 1-20 second time delay. Default: 6 Hz, 10 seconds, enabled.

Loss of sensing voltage shutdown - Shutdown of generator set will occur on loss of voltage sensing inputs to the control.

Field overload shutdown - Uses field voltage to shutdown generator set when a field overload condition occurs.

Field control interface

Input signals to the base control include:

- Remote start
- Local and emergency stop
- Configurable inputs: Control includes (4) input signals from customer discrete devices that are configurable for warning, shutdown or status indication, as well as message displayed

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Output signals from the PowerCommand control include:

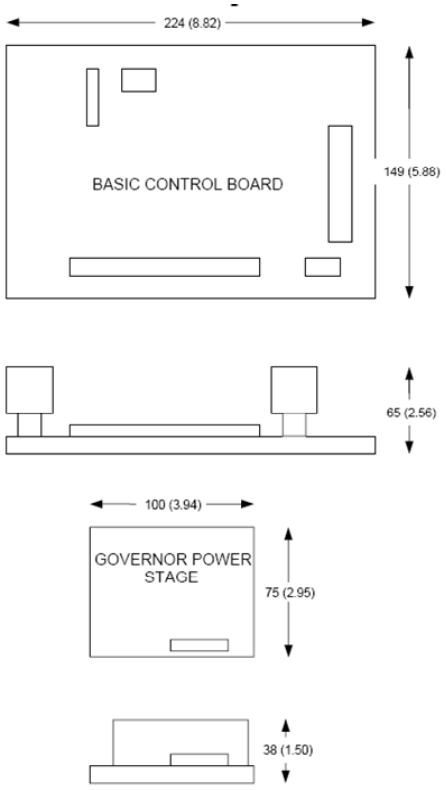
- Configurable relay outputs: Control includes (2) relay output contacts rated at 2 A. These outputs can be configured to activate on any control warning or shutdown fault as well as ready to load, not in auto, common alarm, common warning and common shutdown.
- Ready to load (generator set running) signal: Operates when the generator set has reached 90% of rated speed and voltage and latches until generator set is switched to off or idle mode.

Communications connections include:

- PC tool interface: This RS-485 communication port allows the control to communicate with a personal computer running InPower or PowerCommand for Windows® software.
- Modbus RS-485 port: Allows the control to communicate with external devices such as PLCs using Modbus protocol.

  Note - An RS-232 or USB to RS-485 converter is required for communication between PC and control.
- Networking: This RS-485 communication port allows connection from the control to the other Cummins Power Generation products.

Mechanical drawings



PowerCommand human machine interface HMI211

Description

This control system includes an intuitive operator interface panel that allows for complete genset control as well as system metering, fault annunciation, configuration and diagnostics. The interface includes five generator set status LED lamps with both internationally accepted symbols and English text to comply with customer needs. The interface also includes an LED backlit LCD display with tactile feel soft-switches for easy operation and screen navigation. It is configurable for units of measurement and has adjustable screen contrast and brightness.

The *run/off/auto* switch function is integrated into the interface panel.

All data on the control can be viewed by scrolling through screens with the navigation keys. The control displays the current active fault and a time-ordered history of the five previous faults.

Features

- LED indicating lamps:
  - remote start
  - not in auto
  - shutdown
  - warning
  - auto
  - run
- 128 x 64 pixels graphic LED backlight LCD.
- Four tactile feel membrane switches for LCD defined operation. The functions of these switches are defined dynamically on the LCD.
- Two tactile feel membrane switches dedicated for *off* and *back*.
- Allows for complete genset control setup.
- Certifications: Suitable for use on generator sets that are designed, manufactured, tested and certified to relevant UL, NFPA, ISO, IEC, Mil Std., CE and CSA standards.

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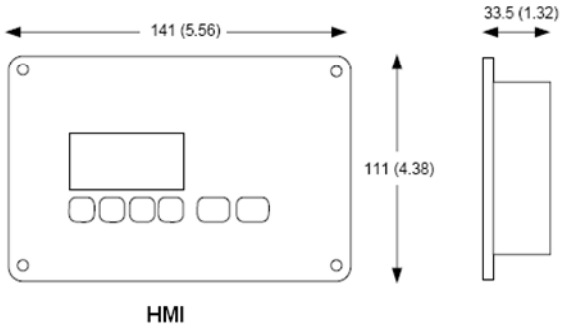
Communications connections

- PC tool interface - This RS-485 communication port allows the HMI to communicate with a personal computer running InPower.
- This RS-485 communication port allows the HMI to communicate with the main control board.

Mechanical drawing



HMI

Dimensions: mm (inches)

Software

InPower (beyond 6.0 version) is a PC-based software service tool that is designed to directly communicate to PowerCommand generator sets and transfer switches, to facilitate service and monitoring of these products.

Environment

The control is designed for proper operation without recalibration in ambient temperatures from -40 ºC (104 ºF) to +70º C (158 ºF), and for storage from -55 ºC (131 ºF) to +80 ºC (176 ºF). Control will operate with humidity up to 95%, non-condensing.

The HMI is designed for proper operation in ambient temperatures from -20 ºC (-4 ºF) to +70 ºC (158 ºF), and for storage from -30 ºC (-22 ºF) to +80 ºC (176 ºF).

PCCNet COMPATIBLE

The control board is fully encapsulated to provide superior resistance to dust and moisture. Display panel has a single membrane surface, which is impervious to effects of dust, moisture, oil and exhaust fumes. This panel uses a sealed membrane to provide long reliable service life in harsh environments.

The control system is specifically designed and tested for resistance to RFI/EMI and to resist effects of vibration to provide a long reliable life when mounted on a generator set. The control includes transient voltage surge suppression to provide compliance to referenced standards.

Certifications

PowerCommand meets or exceeds the requirements of the following codes and standards:

- NFPA 110 for level 1 and 2 systems.
- ISO 8528-4: 1993 compliance, controls and switchgear.
- CE marking: The control system is suitable for use on generator sets to be CE-marked.
- EN 50081-1,2 residential/light industrial emissions or industrial emissions.
- EN 50082-1,2 residential/light industrial or industrial susceptibility.
- ISO 7637-2, level 2; DC supply surge voltage test.
- Mil Std 202C, Method 101 and ASTM B117: Salt fog test.
- PowerCommand control systems and generator sets are designed and manufactured in ISO 9001 certified facilities.
- UL 508 recognized or Listed and suitable for use on UL 2200 Listed generator sets.
- CSA C282-M1999 compliance.
- CSA 22.2 No. 14 M91 industrial controls.

Warranty

All components and subsystems are covered by an express limited one year warranty. Other optional and extended factory warranties and local distributor maintenance agreements are available.

See your distributor for more information

Cummins Power Generation

Americas
1400 73rd Avenue N.E.
Minneapolis, MN 55432 USA
Phone: 763 574 5000
Fax: 763 574 5298

Europe, CIS, Middle East and Africa
Manston Park Columbus Ave.
Manston Ramsgate
Kent CT 12 5BF United Kingdom
Phone 44 1843 255000
Fax 44 1843 255902

Asia Pacific
10 Toh Guan Road #07-01
TT International Tradepark
Singapore 608838
Phone 65 6417 2388
Fax 65 6417 2399

Warning: Back feed to a utility system can cause electrocution and/or property damage. Do not connect to any building's electrical system except through an approved device or after building main switch is open.

Our energy working for you.™

www.cumminspower.com

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Cummins Power Generation

Exhaust Emission Data Sheet
20DSKBA
60 Hz Diesel Generator Set
EPA Emission

Engine Information:

Model:	Kubota Corporation V2203-M	Bore:	3.43 in. (87.0 mm)
Type:	4 Cycle, In-line, 4 Cylinder Diesel	Stroke:	3.64 in. (92.4 mm)
Aspiration:	Natural	Displacement:	134.1 cu. In .(2.197 liters)
Compression Ratio:	23:1		
Emission Control Device:	Naturally Aspirated		

	1/4	1/2	3/4	Full	Full
PERFORMANCE DATA	**Standby**	**Standby**	**Standby**	**Standby**	**Prime**
BHP @ 1800 RPM (60 Hz)	9	17	26	34	31
Fuel Consumption (gal/Hr)	0.6	1.0	1.5	1.9	1.8
Exhaust Gas Flow (CFM)	99	119	143	174	163
Exhaust Gas Temperature (°F)	359	519	722	970	882
EXHAUST EMISSION DATA					
HC (Total Unburned Hydrocarbons)	0.45	0.18	0.08	0.04	0.05
NOx (Oxides of Nitrogen as NO2)	6.20	4.40	3.40	2.20	2.70
CO (carbon Monoxide)	0.30	0.50	2.10	0.40	0.40
PM (Particular Matter)	0.25	0.11	0.11	0.36	0.25
Smoke (Bosch)	0.00	0.00	0.30	0.80	0.50

All values are Grams per HP-Hour

TEST CONDITIONS

Data is representative of steady-state engine speed (± 25 RPM) at designated genset loads. Pressures, temperatures, and emission rates were stabilized.

Fuel Specification:	ASTM D975 No. 2-D diesel fuel with 0.03-0.05% sulfur content (by weight), and 40-48 cetane number.
Fuel Temperature:	99 ± 9 °F (at fuel pump inlet)
Intake Air Temperature:	77 ± 9 °F
Barometric Pressure:	29.6 ± 1 in. Hg
Humidity:	NOx measurement corrected to 75 grains H2O/lb dry air
Reference Standard:	ISO 8178

The NOx, HC, CO and PM emission data tabulated here are representative of test data taken from a single engine under the test conditions shown above. Data for the other components are estimated. These data are subjected to instrumentation and engine-to-engine variability. Field emission test data are not guaranteed to these levels. Actual field test results may vary due to test site conditions, installation, fuel specification, test procedures and instrumentation. Engine operation with excessive air intake or exhaust restriction beyond published maximum limits, or with improper maintenance, may results in elevated emission levels.

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EPA Tier 4 Exhaust Emission Compliance Statement 20DSKBA

60 Hz Diesel Generator Set

Compliance Information:

The engine used in this generator set complies with U.S. EPA and California emission regulations under the provisions of 40 CFR 1039, Nonroad (Mobile Off Highway) Tier 4 emissions limits when tested per 40 CFR 1065.

Engine Manufacturer:	Kubota Corporation
EPA Certificate Number:	KBX-NRCI-10-28
Effective Date:	10/9/2009
Date Issued:	10/9/2009
EPA Nonroad Diesel Engine Family:	AKBXL02.2FCC
CARB Executive Order:	U-R-025-0438

Engine Information:

Model:	Kubota Corporation V2203-M	Bore:	3.43 in. (87 mm)
Engine Nameplate HP:	36.1		
Type:	4 Cycle, In-line,4 Cylinder Diesel	Stroke:	3.64 in. (94 mm)
Aspiration:	Natural	Displacement:	134.1 cu. in. (2.2 liters)
Compression Ratio:	23.0:1		
Emission Control Device:	none		

U.S. Environmental Protection Agency Nonroad Tier 4 Limits

COMPONENT	(All values are Grams per HP-Hour)
NOx + HC (Oxides of Nitrogen as NO2 + Total Unburned Hydrocarbons)	5.6
CO (Carbon Monoxide)	4.1
PM (Particulate Matter)	0.22

Engine operation with excessive air intake or exhaust restriction beyond published maximum limits, or with improper maintenance, may result in elevated emission levels.

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Power Generation

Sound Data

20DSKBA 60Hz

Sound Pressure Levels @ 7 meters dB(A)

Configuration		Position (Note 1)								8 Position Average
		1	2	3	4	5	6	7	8	
Standard-Unhoused (Note 3)	Infinite Exhaust	71.0	75.0	73.5	73.5	70.8	73.7	71.3	74.4	73.2
F182 - Enclosure-Steel, Weather Protective,with ExhSys	Mounted Muffler	78.8	81.3	80.7	80.0	78.8	79.0	78.1	80.6	79.8
F216- Enclosure-Aluminum,Weather Protective,w/Exh System	Mounted Muffler	78.8	81.3	80.7	80.0	78.8	79.0	78.1	80.6	79.8
F172 - Enclosure-Steel,Sound Att,Level 1,w/Exhaust System	Mounted Muffler	74.0	72.6	66.9	66.3	66.6	68.5	71.5	76.1	72.3
F173 - Enclosure-Steel,Sound Att,Level 2,w/Exhaust System	Mounted Muffler	65.0	65.4	64.5	64.8	66.6	68.5	68.4	69.4	67.0
F217- Enclosure-Aluminum,Sound Att,Level 2,w/ExhSystem	Mounted Muffler	67.0	67.4	66.5	66.8	68.6	70.5	70.4	71.4	69.0

Note:
1. Position 1 faces the engine front at 23 feet (7 m) from the surface of the generator set. The positions proceed around the generator set in a counter-clockwise direction in 45° increments.
2. Data based on full rated load with standard radiator-fan package.
3. Sound data for generator set with infinite exhaust do not include exhaust noise.
4. Sound pressure levels per ANSI S1.13-1971 as applicable.
5. Reference sound pressure is 10 µPa.
6. Sound pressure levels are subject to instrumentation, measurement, installation and generator set variability.

Sound Power Levels dB(A)

Configuration		Octave Band Center Frequency (Hz)								Sound Power Level
		63	125	250	500	1000	2000	4000	8000	
Standard-Unhoused (Note 3)	Infinite Exhaust	78.7	83.3	86.9	91.9	94.9	95.5	92.6	87.8	100.6
F182 - Enclosure-Steel, Weather Protective,with ExhSys	Mounted Muffler	88.2	97.2	98.8	92.8	103.4	96.6	98.0	97.4	107.4
F216- Enclosure-Aluminum,Weather Protective,w/Exh System	Mounted Muffler	88.2	97.2	98.8	92.8	103.4	96.6	98.0	97.4	107.4
F172 - Enclosure-Steel,Sound Att,Level 1,w/Exhaust System	Mounted Muffler	86.9	94.0	92.0	89.7	91.8	92.1	88.0	78.5	102.2
F173 - Enclosure-Steel,Sound Att,Level 2,w/Exhaust System	Mounted Muffler	86.5	94.0	89.3	85.9	83.9	84.8	81.0	71.7	96.9
F217- Enclosure-Aluminum,Sound Att,Level 2,w/ExhSystem	Mounted Muffler	88.5	96.0	91.3	87.9	85.9	86.8	83.0	73.7	98.9

Note:
1. Sound pressure levels per ANSI S12.34-1988 and SIO 3744 as applicable.
2. Data based on full rated load with standard radiator-fan package.
3. Sound data for generator set with infinite exhaust do not include exhaust noise.
4. Reference sound pressure is 1pW-1x10^{-12} W.
5. Sound pressure levels are subject to instrumentation, measurement, installation and generator set variability.

Exhaust Sound Pressure Levels @ 1 meter dB(A)

Open Exhaust (No Muffler) @ Rated Load	Octave Band Center Frequency (Hz)								Sound Pressure Level
	63	125	250	500	1000	2000	4000	8000	
	72.4	85.0	85.6	91.4	100.3	101.7	100.7	99.0	106.7

Note: Sound pressure level per ISO 6798 Annex A as applicable.

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Power Generation

ALTERNATOR DATA SHEET — Frame Size YD0862

CHARACTERISTICS

WEIGHTS:	Stator Assembly:	**218 lb**	**99 kg**
	Rotor Assembly:	**157 lb**	**71 kg**
	Complete Assembly:	**452 lb**	**205 kg**
MAXIMUM SPEED:		**2250**	RPM
EXCITATION CURRENT:	Full Load	**1.8**	Amps
	No Load	**0.60**	Amps
INSULATION SYSTEM:	Class H Throughout		

1 ∅ RATINGS (1.0 power factor)

(Based on specific temperature rise at 40°C ambient temperature)

60 Hz Voltage (Winding Number)

		Double Delta 120/240 (311)	4 Lead 120/240 (06)
125°C Rise Ratings	kW/kVA	**30.0/30.0**	**31.0/31.0**
105°C Rise Ratings	kW/kVA	**29.0/29.0**	**30.0/30.0**
80°C Rise Ratings	kW/kVA	**24.0/24.0**	**25.0/25.0**

Percent Rated Load (30kW base)	110	100	75	50	25
Double Delta Efficiency (%)	**84.4**	**85.1**	**86.4**	**85.7**	**82.6**
4 Lead Efficiency (%)	**85.0**	**85.8**	**87.4**	**88.1**	**85.4**

1 ∅ MOTOR STARTING

	Double Delta	4 Lead
Maximum kVA (90% Sustained Voltage) (Shunt)	**87**	**87**
Voltage Dip @ 2xRated kVA(%)	**29**	**29**

3 ∅ RATINGS (0.8 power factor)

(Based on specific temperature rise at 40°C ambient temperature)

60 Hz Voltage (Winding Number)

		120/208 240/416 (311)	139/240 277/480 (311)	347/600 (07)
125°C Rise Ratings	kW/kVA	**30.0/37.5**	**30.0/37.5**	**30.0/37.5**
105°C Rise Ratings	kW/kVA	~~**30.0/37.5**~~	**30.0/37.5**	**30.0/37.5**
80°C Rise Ratings	kW/kVA	**27.5/34.4**	**27.5/34.4**	**27.5/34.4**

Percent Rated Load (30kW base)	110	100	75	50	25
Efficiency (%)	**86.2**	**86.4**	**86.4**	**84.9**	**79.3**

3 ∅ REACTANCES (per unit ± 10%)

(Based on full load at 105C Rise Rating)

	120/208 240/416	139/240 277/480	347/600
Synchronous	**1.93**	**1.93**	**1.94**
Transient	**0.09**	**0.09**	**0.09**
Subtransient	**0.06**	**0.06**	**0.06**
Negative Sequence	**0.10**	**0.10**	**0.10**
Zero Sequence	**0.04**	**0.04**	**0.04**

3 ∅ MOTOR STARTING

	120/208 240/416	139/240 277/480	347/600
Maximum kVA (90% Sustained Voltage)	**120**	**120**	**120**
Voltage Dip @ 2xRated kVA(%)	**26**	**26**	**26**

TIME CONSTANTS (Sec)

Transient	**0.036**
Subtransient	**0.005**
Open Circuit	**0.073**
DC	**0.005**

WINDINGS (@20°C)

	Parallel Wye	Series Wye	347/600	4 Lead
Stator Resistance (Ohms per phase)	**0.0689**	**0.276**	**0.432**	**0.065**
Rotor Resistance (Ohms)	**2.43**	**2.43**	**2.43**	**2.43**
Number of Leads	**12.00**	**12.00**	**4.00**	**4.00**
Stator Coil Resistance (T1-T4, T2-T5,etc.)	**0.0689**	**0.0689**	**0.1081**	**0.0326**

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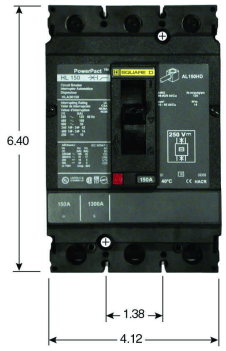
KS94 - 150 AMP H-FRAME SET @ 40 AMP TRIP MOUNTED ON RIGHT SIDE

PowerPact® H-Frame Circuit Breakers in 15A to 150A



Common mounting dimensions across the entire range means that the mounting pattern never has to change even when panel designs change. Shown above: A H-Frame Powerpact Circuit Breaker.

Circuit Breakers for Control Panel Applications

Designed to address the unique demands of panel builders, PowerPact H-frame Molded Case Circuit Breakers give you the right combination of features and performance to satisfy your circuit breaker requirements. PowerPact circuit breakers deliver unmatched design flexibility across the entire range of 15A to 150A frame sizes offering the benefits of a flexible, modular circuit breaker that panel builders demand.

Design standardization enables panel builders to improve their productivity so when specifications change, the panel design can remain the same. Thoughtful features that make this possible include:

- Common mounting dimensions (shown left) across the range saves time, so that although specifications may change, the circuit breaker location remains the same.
- Common accessories, actuators and trim dimensions across the range increases flexibility to meet specification changes.
- Field-installable trip units and accessories allow for late cycle modifications to the circuit breaker for after-the-fact flexibility.
- Snap-in terminals can provide terminal solutions for a broad range of control panels for increased productivity.

PowerPact H-Frame Circuit Breakers come in many interruption ratings and are designed to limit let-through currents to provide better protection for downstream components.

These circuit breakers are also certified to global standards including UL, IEC, CSA and NOM offering you the ability to comply with local standards wherever that might be.

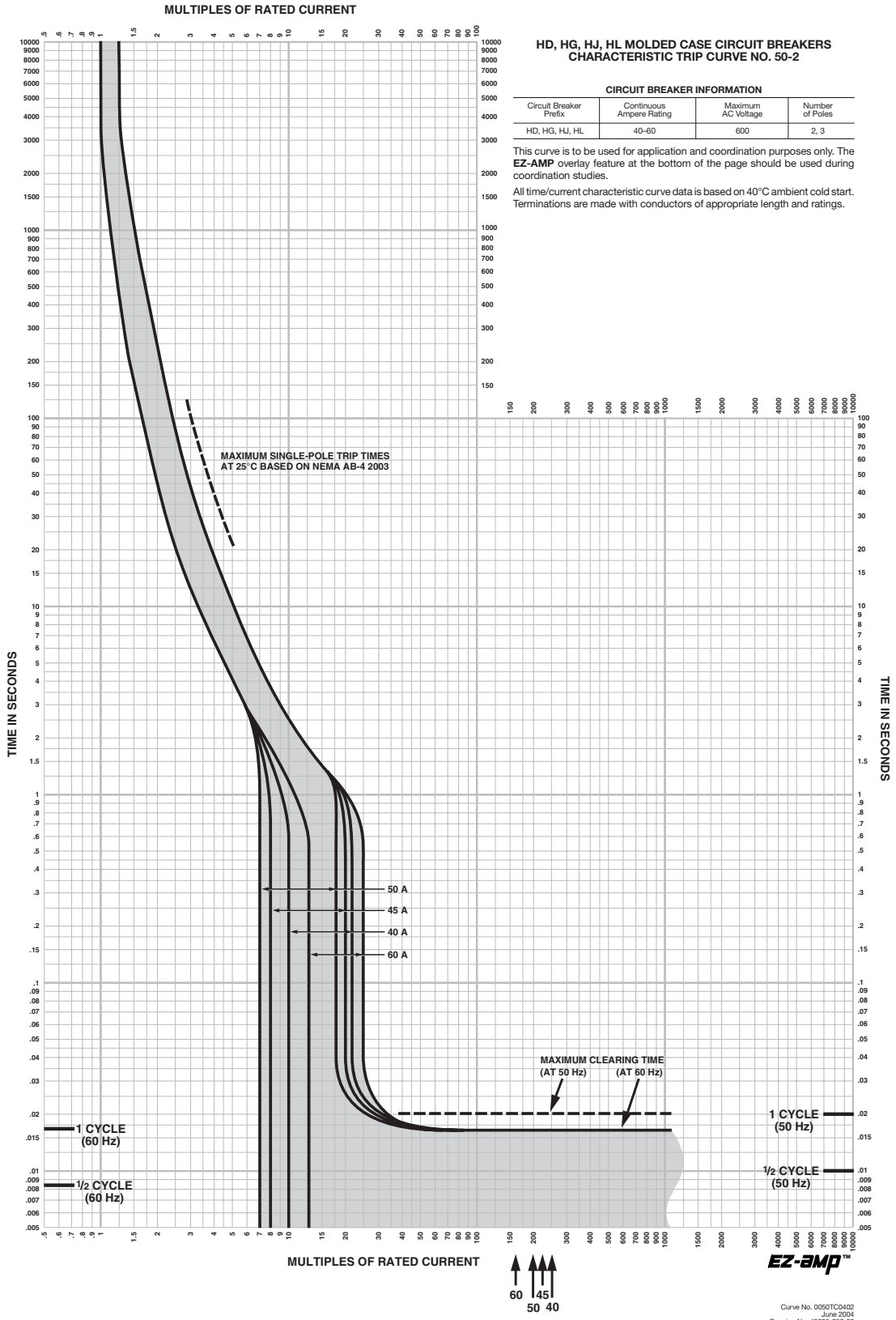
UL 489 Interruption Ratings

	Volts	"G"
	240V	65kA
	480V	35kA
	600V	18kA
H-Frame 15-150A		HG

a brand of Schneider Electric

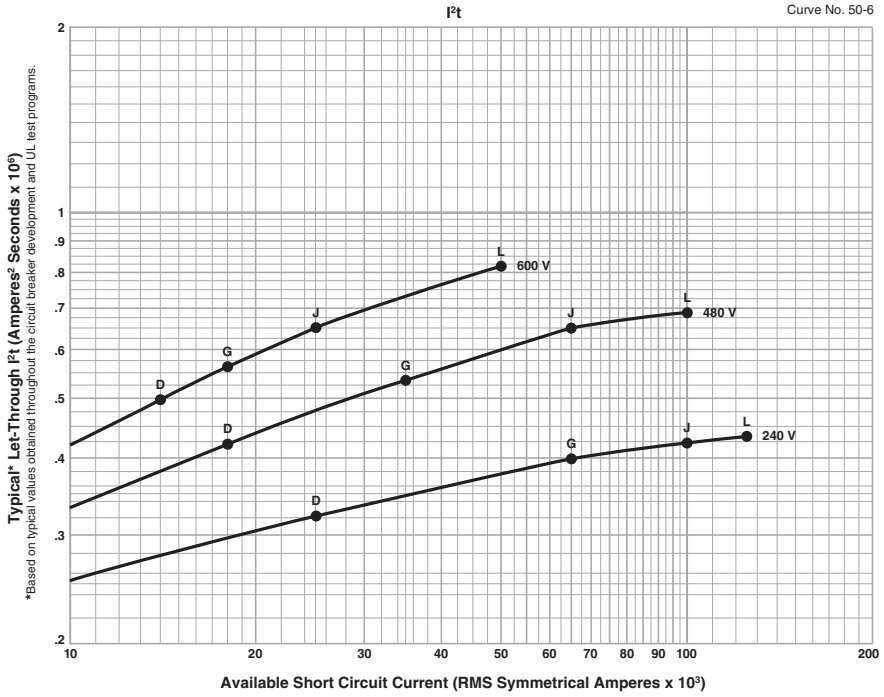
SQUARE D

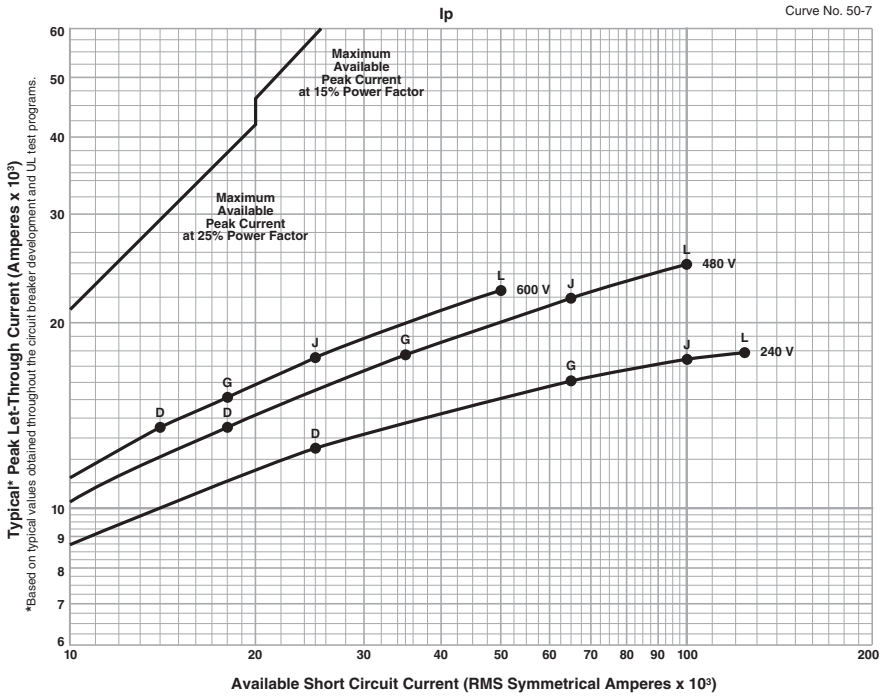
40-60 A — HD, HG, HJ and HL


MULTIPLES OF RATED CURRENT
HD, HG, HJ, HL MOLDED CASE CIRCUIT BREAKERS
CHARACTERISTIC TRIP CURVE NO. 50-2
CIRCUIT BREAKER INFORMATION
Circuit Breaker Prefix
Continuous Ampere Rating
Maximum AC Voltage
Number of Poles
HD, HG, HJ, HL
40–60
600
2, 3
This curve is to be used for application and coordination purposes only. The EZ-AMP overlay feature at the bottom of the page should be used during coordination studies.
All time/current characteristic curve data is based on 40°C ambient cold start. Terminations are made with conductors of appropriate length and ratings.
MAXIMUM SINGLE-POLE TRIP TIMES AT 25°C BASED ON NEMA AB-4 2003
50 A
45 A
40 A
60 A
MAXIMUM CLEARING TIME
(AT 50 Hz)
(AT 60 Hz)
1 CYCLE (60 Hz)
1/2 CYCLE (60 Hz)
1 CYCLE (50 Hz)
1/2 CYCLE (50 Hz)
TIME IN SECONDS
TIME IN SECONDS
MULTIPLES OF RATED CURRENT
60
50
45
40
EZ-amp™
Curve No. 0050TC0402
June 2004
Drawing No. 48095-050-02

H-frame 150 A (HD, HG, HJ, and HL)

Curve No. 50-6 Let-Through I^2t and 50-7 Peak Let-Through Current I_p





0320_2346 D

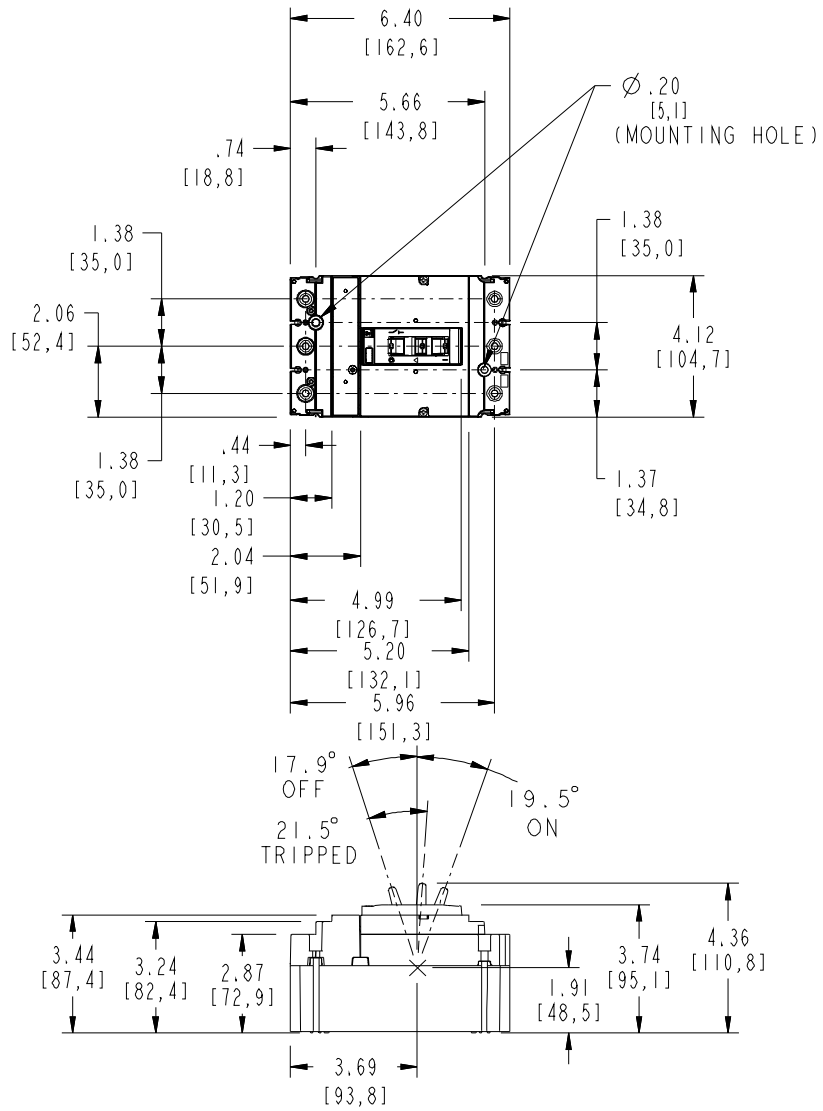
ER NO.	LTR	NO.	REVISION	ZONE	DR	CHKR	APPROVED	DATE
FRD23772	A	1	PRODUCTION_RELEASE	-	SAJ	PPL	PPL	05-02-05

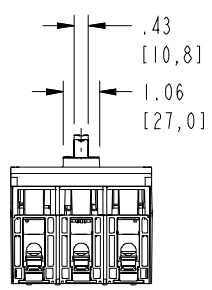
NOTES:

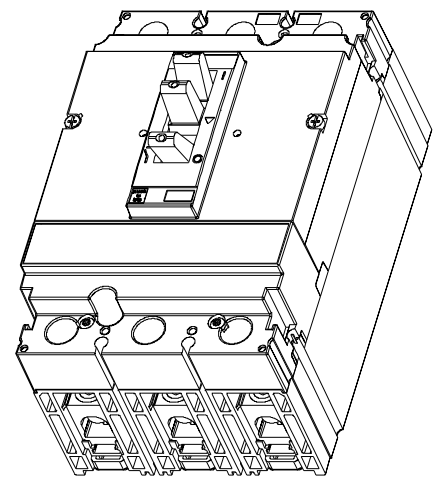
1. THIS PART IS VENDOR SOURCE CONTROLLED.
2. 3 POLE THERMAL-MAGNETIC 50/60 Hz.
3. SUPPLIED WITH LINE & LOAD LUGS (#14-3/0 AWG AL OR CU).
4.

INTERRUPTING RATINGS		
UL/ CSA/ NOM	240 V	65
	480Y/277 Vac	35
	480 Vac	35
	600Y/347 Vac	18
	600 Vac	18
IEC 947-2 Icu/Ics	220/240 Vac	65/16
	380/415 Vac	35/8
	500/525 Vac	18/4

5. .65" WIRE STRIP LENGTH, LUG TORQUE=#14-#10 AWG 50 LB-IN, #8-3/0 120 LB-IN.







ISOMETRIC VIEW

-THIS IS A CONTROLLED PRODUCT-
PER ONAN PROCEDURE FRE-1002

TO MAINTAIN COMPLIANCE WITH REQUIREMENTS OF THE CODES, STANDARDS, OR AGENCIES LISTED BELOW

☒ CSA ☒ UL ☐ EC ☐ BVIA ☐ ABYC
☐ OTHER _____ ☐ OTHER _____

AND/OR ASSIGN INTERNAL ONAN DESIGN CONTROL FACILITIES ☐

CHANGES, DEVIATIONS, OR SUBSTITUTIONS OF MATERIAL, PROCESS, OR PERFORMANCE FOR THIS PRODUCT MUST BE APPROVED BY THE FOLLOWING DESIGN CONTROL FACILITIES

DESIGN CONTROL FACILITY FRIDLEY
DESIGN CONTROL FACILITY _____

CLASSIFICATION OF CHARACTERISTICS
CRITICAL ●
MAJOR ◐
MINOR (NONE)
LINE BELOW SYMBOL ● APPLIES TO UPPER LIMIT
LINE ABOVE SYMBOL ● APPLIES TO LOWER LIMIT
NO LINE WITH SYMBOL APPLIES TO BOTH LIMITS
▼ KEY INSTRUCTION (NO TOLERANCE)

APPROVED P_LARSON
DATE 05-02-05

METRIC DWG
Pro/ENGINEER

DO NOT SCALE PRINT

ANG TOL± 0.0
DRAWN TO SCALE OF 1/1

TOLERANCE UNLESS OTHERWISE SPECIFIED		
DIM	mm	Inch
	X ± 1 .X ± 0.8 .XX ± 0.38	.X ± .XX ± .XXX±
MCLE	0.00- 4.99 ±0.15/-0.08 5.00- 9.99 ±0.20/-0.10 10.00-17.49 ±0.25/-0.13 17.50-24.99 ±0.30/-0.13	.004-.200 +.006/-.003 .201-.421 +.008/-.004 .422-.703 +.010/-.005 .704-.999 +.012/-.005

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SIM TO 0320_1959
COPIED FROM -
THIRD ANGLE PROJECTION

ITEM	PART NO.	DWG SIZE	DESCRIPTION OR MATERIAL	REF DES
	NAME		DATE	
DR	S_JOHNSON		05-02-05	
CHKR ☐ MFG ☒	P_LARSON		05-02-05	
APPROVED	P_LARSON		05-02-05	

FOR INTERPRETATION OF DIMENSIONING AND TOLERANCING, SEE ANSI Y14.5M-1982

MODEL FIRST USED ON GENERAL

Minneapolis, Minnesota 55432

TITLE CIRCUIT_BREAKER (H-FRAME)

DRG NO. 0320_2346

SHEET 1 of 1

DWG SIZE D

Keep your heavy-duty equipment operating with Deka Commercial Batteries.

- Special computer-aided design and manufacturing mean **more durability** for heavy-duty line-haul trucks, buses, farm tractors and off-road equipment.
- Most of our commercial batteries contain premium "deep pocket" **envelope separators,** which protect the plates on all four sides to dramatically reduce shorting and **extend service life.**
- **Genuine calcium lead** alloy provides **longer waterless operation** and extended battery life.
- **Anchor-locked elements** with radial grid and tight-pack commercial plates resist the damaging effects of vibration, delivering **more power-per-pound** than other batteries.
- Deka Commercial Batteries are available wet and many can be ordered bone-dry. Our special **dry-charge process** completely eliminates moisture for virtually unlimited shelf life when compared to inferior "moist-dry" types.
- Most popular sizes feature **tough polypropylene cases** which resist breakage and extend service life. Many are also available with handles and special terminals for easy installation.
- Deka offers the **most complete line** of enveloped calcium maintenance-free commercial batteries in the industry. Our line includes such **hard-to-find** group sizes as 3D.
- More than **250 quality control checks** ensure the highest quality.

LEAD RETURN Pb RECYCLE

QUALITY SYSTEM CERTIFIED TO
ISO 9001
ISO/TS 16949
ISO 14001

COMMERCIAL BATTERIES

"POWERED FOR PERFORMANCE"®

DISTRIBUTED BY:

EAST PENN manufacturing co., inc.
Lyon Station, PA 19536-0147 • Phone: 610-682-6361 • Fax: 610-682-4781
Order Department Hotline: 610-682-4231
www.dekabatteries.com • E-mail: eastpenn@eastpenn-deka.com

Deka® COMMERCIAL BATTERIES

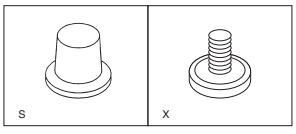
GROUP NO.	PART NO.	PERFORMANCE LEVEL			WARR.	WEIGHT		MAXIMUM OVERALL DIEMENSIONS						FOOTNOTES
		CCA @ 0˚F	RES. CAP.	REF. CA. @ 32˚F		WET	DRY	LENGTH		WIDTH		HEIGHT		
								in	mm.	in	mm.	in	mm.	
8-VOLT COMMERCIAL SERVICE														
1	801	520	102	650	24	31.5	19	8⅞	225	6¾	171	8⅞	225	12,25,30
6-VOLT HEAVY-DUTY COMMERCIAL SERVICE														
1	901MF	650	180	815	30	33.5	18	9	229	6⅞	175	8¾	222	21,25,30
2	902	780	200	940	30	36.5	—	10⅜	264	6⅞	175	8¾	222	12,25
3D	903DY	1400	675	1660	30	120	84	20⅜	518	8¾	222	10	254	11,17,20,25,32
3EH	93EH	925	250	1095	30	47.5	—	19¼	489	4¼	108	10	254	12,25
4	904MF	1000	270	1220	30	47	—	12½	3	6⅞	175	9½	241	21,25
5D	905D	880	300	1100	30	50	—	13⅜	340	7⅛	181	9¼	235	12,25
7D	907D	950	350	1120	30	59.5	34	15¾	400	7	178	9⅛	232	11,25,31
12-VOLT HEAVY-DUTY COMMERCIAL SERVICE														
3ET	93ET	500	120	625	30	48	—	19¼	489	4¼	108	9⅞	251	12,25
4D	904D	1050	290	1280	30	99.5	58	20¾	527	8½	216	10⅛	258	12,17,25,31
	804D	950	250	1160	30	97	—							12,17,25
4DLT	94DLT	900	240	1065	30	80	—	20	508	8⅛	206	8⅛	206	12,19,25
8D	908DMF	1500	450	1825	30	134	—	20¾	527	11	279	10	254	17,21,25
	908D	1400	430	1700	30	130	80							12,17,25,31
	708D	1100	325	1340	30	117.5	—							12,17,25
17TF	917TF	530	150	630	30	58.5	—	17	32	6⅞	175	8	203	11,15,19,25
28	928MF	550	100	685	30	41.5	—	10¼	260	6¾	171	9½	241	21,22,X
30H	1130HMF	925	170	1110	30	57.5	—	13	330	6¾	171	9½	241	19,21,22
	930H	650	145	810	30	51	—							19,21,22
31	1231MF	1125	195	1260	30	61	—	13	330	6¾	171	9½	241	19,21,22,X
	1131XMF	1000	185	1190	30	58	43							19,21,22,30,X
	1131MF	925	170	1110	30	56.5	—							19,21,22,X
	1031MF	760	170	910	30	54.5	—							19,21,22,X
	931MF	650	145	810	30	51	—							19,21,22,X
31P	1231PMF	1125	195	1260	30	61	—	13	330	6¾	171	9½	241	19,21,22,S
	1131XPMF	1000	185	1190	30	58	—							19,21,22,S
	1131PMF	925	170	1110	30	56.5	—							19,21,22,S
	1031PMF	760	170	910	30	54.5	—							19,21,22,S
	931PMF	650	145	810	30	51	—							19,21,22,S
12-VOLT HEAVY-DUTY COMMERCIAL SEVERE SERVICE–DUAL PURPOSE (W/ DOUBLE INSULATED GLASS MAT SEPARATORS)														
31	7T31	730	190	940	30	62.5	—	13	330	6¾	171	9½	241	19,21,22,43,X
31	DP31CS	700	180	875	30	57	—							19,21,22,43,X
31P	DP31PCS	700	180	875	30	57	—							19,21,22,43,S

Ratings conform to B.C.I. specifications.

Dry = up to 10% reduced capacity.

All batteries are maintenance-free, calcium grids except where noted.

All batteries manufactured in black polypropylene cases and covers except where noted.



FOOTNOTES:

S - SAE "automotive type" post
X - 3/8" x 16 stainless steel stud posts
11 - Low maintenance – Low antimony grids
12 - Hybrid construction
15 - Hard rubber, one-piece cover construction
17 - Includes handle
19 - Includes lifting ledges
20 - Hard rubber, multi-cell cover construction
21 - Anchor lock elements
22 - Flush manifold vented cover
25 - With individual vent caps
30 - Available dry-add "D" suffix to part number
31 - Available dry-add "Y" suffix to part number
32 - Available dry charge only
43 - Warranty is 12 months in deep cycle service

MEMBER:

ATA AMERICAN TRUCKING ASSOCIATION

TMC TECHNOLOGY & MAINTENANCE COUNCIL

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NRG

Intelligent Engine Start Battery Charger

The Smart Choice for Mission-Critical Engine Starting

- **Fast, accurate, mission-critical charging** – gives best starting reliability
- **Replace nearly any charger** – without planning ahead
- **Industry-first battery-fault alarm** - helps dispatch service early
- **1 million hour observed MTBF** – means longest charger life
- **Smart design** – stops load dump and other damaging transients

ISO 9000 c UL us LISTED CE

SENS®
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NRG Battery Charger Benefits and Features

Failure to start due to battery problems is the leading cause of inoperable engine generator sets.

SENS NRG battery charger maximizes starting system reliability while slashing genset servicing costs:

One NRG replaces almost any charger without extra site visits. Installers can select or change at any time 120, 208 or 240 volts AC input, 12 or 24-volt battery and output settings optimized for nearly any lead-acid or nickel cadmium battery.

Easy to understand user interface provides state-of-the-art system status – including digital metering, NFPA 110 alarms and a battery fault alarm that can send service personnel to the site before failure to start.

Batteries charged by NRG give higher performance and last longer. In uncontrolled environments precision charging by SENS increases battery life and watering intervals 400% or more.

NRG meets all relevant industry standards – including UL, NFPA 110 and CE. All units are either C-UL listed or C-UL recognized. 50/60 Hz units add CE marking to UL agency marks.

***EnerGenius* reliability technology built into every charger includes:**

- All-electronic operation with generous component de-rating
- Disconnected/reversed/incorrect voltage battery alarm and protection
- Protection of connected equipment against load dump transients
- Widest temperature rating, and overtemperature protection
- Superior lightning and voltage transient protection
- Demonstrated field MTBF > 1 million hours
- Standard 3-year warranty and available reimbursement of customer field service costs

Earn the best return on your charger investment – choose SENS NRG

NRG Specifications

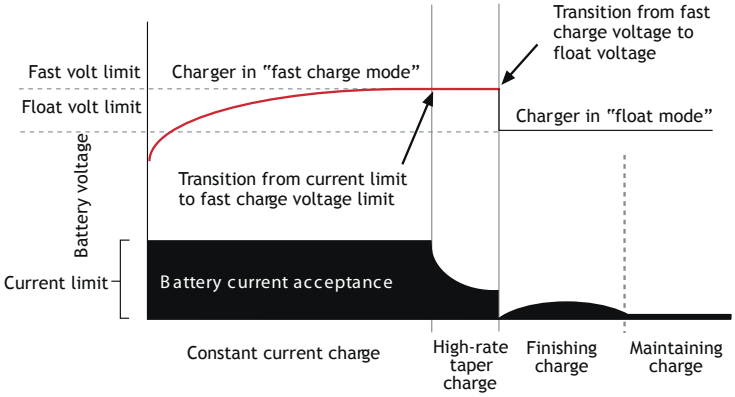
AC Input

Voltage	110-120/208-240 VAC, ±10%, single phase, switch selectable
Input current	10A charger: 6.6/3.3 amps maximum 20A charger: 12.6/6.3 amps maximum
Frequency	60 Hz ±5% standard; 50/60 Hz ±5% optional
Input protection	1-pole fuse, soft-start, transient suppression

Charger Output

Nominal voltage ratings	12 or 24 volt nominal
Optional voltage rating	12/24 volt, field selectable
Battery settings	Six discrete battery voltage programs - Low or high S.G. flooded - Low or high S.G. VRLA - Nickel cadmium 9, 10, 18, 19 or 20 cells
Regulation	±0.5% (1/2%) line and load regulation
Current	10 or 20 amps nominal
Electronic current limit	105% rated output typical – no crank disconnect required
Charge characteristic	Constant voltage, current limited, 4-rate automatic equalization
Temperature compensation	Enable or disable anytime, remote sensor optional
Output protection	Current limit, 1-pole fuse, transient suppression

Standard 4-rate charging



User Interface, Indication and Alarms

Digital meter	Switch-selectable meter for output volts, amps
Accuracy	±2% volts, ±5% amps
Alarms	LED and Form C contact(s) per table:

Front panel status display

Alarm System Functions

	Alarm code "1"[1]	Alarm code "C" (meets requirements of NFPA 110)
AC good	LED	LED
Float mode	LED	LED
Fast charge	LED	LED
Temp comp active	LED	LED
AC fail	LED[2]	LED and Form C contact
Low battery volts		LED and Form C contact
High battery volts		LED and Form C contact
Charger fail	LED[2]	LED and Form C contact
Battery fault[3]	LED[2]	LED and Form C contact

1. Alarms "1" available only on 10A charger
2. Form C contact provides summary alarm of these conditions. BBHH chargers include this alarm configuration. Contacts rated 2A @ 26 VDC resistive
3. Battery fault alarm indicates these fault conditions:
   - Battery disconnected - Battery polarity reversed - Mismatched charger battery voltage - Open or high resistance charger to battery connection - Open battery cell or excessive internal resistance

Controls

AC input voltage select	Field-selectable switch
Optional 12/24-volt output select	Field-selectable two-position jumper
Battery program select	Field-selectable six-position jumper
Fast charger enable/disable	Field-selectable two-position jumper
Temp compensation enable	Standard. Can be disabled or re-enabled in the field
Remote temp comp enable	Connect optional remote sensor to temp comp port

Simple field adjustments

Environmental

Operating temperature	-20C to +60C, meets full specification to +45C
Over temperature protection	Gradual current reduction to maintain safe power device temperature
Humidity	5% to 95%, non-condensing
Vibration (10A unit)	UL 991 Class B (2G sinusoidal)
Transient immunity	ANSI/IEEE C62.41, Cat. B, EN50082-2 heavy industrial

Agency Standards

Safety	C-UL listed to UL 1236 (required for UL 2200 gensets), CSA standard 22.2 no. 107.2-M89 CE: 50/60 Hz units DOC to EN 60335
Agency marking	60 Hz: C-UL-US listed 50/60 Hz: C-UL-US listed plus CE marked
EMI	FCC Part 15 Class B; EN 50081-2
NFPA standards	NFPA 70, NFPA 110. (NFPA 110 requires Alarms "C")
Optional agency compliance	Units with Alarms "1" configuration available with additional compliance to UL category BBHH and NFPA 20

Construction

Housing/configuration	Material: Heavy clear anodized aluminum. Configuration options: • Fully enclosed: C-UL listed enclosure • Open frame: C-UL recognized • Slimline: C-UL recognized open frame construction with remote isolation transformer
Packaging	Open-frame and Slimline configurations only available in bulk OEM quantities and packaging
Dimensions	See Drawings and Dimensions page for details
Printed circuit card	Surface mount technology, conformal coated
Cooling	Natural convection
Protection degree	Listed housing: NEMA-1 (IP20). Optional NEMA 3R enclosure
Damage prevention	Fully recessed display and controls
Electrical connections	Compression terminal blocks

Warranty

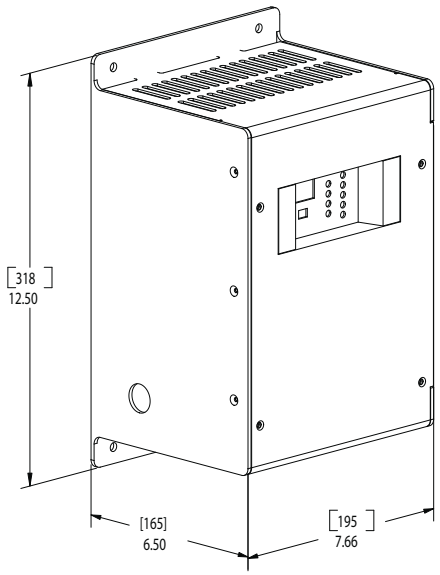
Standard warranty	Three year parts and labor warranty from date of shipment
Optional warranty	If specified at time of order, warranty coverage is increased to reimburse customer's documented field service costs up to the original charger price. Contact the factory for full details

Optional features

Input	Input frequency, 50/60 Hz
Remote temp comp sensor	Recommended where battery and charger are in different locations
Drip shield	Protects from dripping water
NEMA 3R housing	Enables outdoor installation (remote temp sensor recommended)
UL BBHH listing	Available in 10A units with Alarms "1"
Field service warranty	Reimbursement of customer field service expenses up to charger price

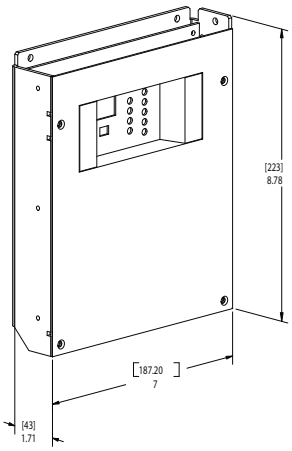
Drawings and Dimensions

10A Chargers
Enclosed and Open Frame Configurations

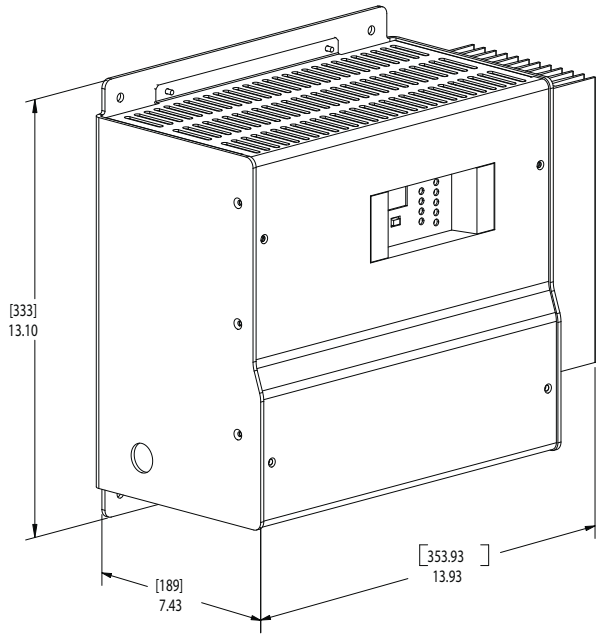


Open-frame configuration omits front cover

10A Chargers
Slimline Open Frame Configuration



Slimline can be mounted either flat or edgewise



Open-frame configuration omits front cover

20A Chargers
Enclosed and Open Frame Configurations

Housing Dimensions Table

Amps	Configuration	Width	Depth	Height
10	Enclosed	7.66" (195 mm)	6.50" (165 mm)	12.50" (318 mm)
10	Open-frame	7.66" (195 mm)	6.50" (165 mm)	12.50" (318 mm)
10	Slimline – flat mount	7.00" (187 mm)	1.71" (43 mm)	8.78" (223 mm)
10	Slimline – edge mount	1.71" (43 mm)	7.00" (187 mm)	8.78" (223 mm)
20	Enclosed	13.93" (354 mm)	7.43" (189 mm)	13.10" (333 mm)
20	Open-frame	13.93" (354 mm)	7.43" (189 mm)	13.10" (333 mm)

111009 B

NRG Ordering Information

Output volts	Output amps	Model	Available configurations	NFPA 110 Alarms	Lbs/Kg
12	10	NRG12-10-R1	Enclosed, Open-frame, Slimline	No	19 / 8.7
12	10	NRG12-10-RC	Enclosed, Slimline	Yes	19 / 8.7
24	10	NRG24-10-R1	Enclosed, Open-frame, Slimline	No	24 / 10.9
24	10	NRG24-10-RC	Enclosed, Slimline	Yes	24 / 10.9
12/24	10	NRG22-10-R1	Enclosed, Open-frame, Slimline	No	24 / 10.9
12/24	10	NRG22-10-RC	Enclosed, Slimline	Yes	24 / 10.9
12	20	NRG12-20-RC	Enclosed, Open-frame	Yes	39 / 17.7
24	20	NRG24-20-RC	Enclosed, Open-frame	Yes	42 / 19.1
12/24	20	NRG22-20-RC	Enclosed, Open-frame	Yes	42 / 19.1

All models offer field-selectable input 120/208-240 volts. 60 Hz input is standard with C-UL listing. Optional 50/60 Hz input includes C-UL listing and adds CE mark.

Model Number Breakout

Model

Output voltage
- 12: 12 volts
- 24: 24 volts
- 22: 12/24-volt field selectable

Output current
- 10: 10 amps
- 20: 20 amps

AC input
- R: 120/208-240 VAC, 60 Hz
- H: 120/208-240 VAC, 50/60 Hz

Alarm system code
- 1: LED and single Form C contact
- C: LEDs and Form C contacts to meet NFPA 110

Housing/Agency
- L: Enclosed: C-UL listed
- R: Open-frame: C-UL recognized
- S: Slimline open-frame: C-UL recognized (10A only)

UL category code
- S: UL category BBGQ (standard)
- H: UL category BBHH (Alarms "1" only)

The Smart Choice for Mission-Critical Engine Starting

Additional Information

Contact SENS or your local sales representative for additional specification, engineering and installation information

ISO 9000 c UL us LISTED CE

Contact Information

For information and service on any SENS product, please contact us at:
Sales 1.866.736.7872 • 303.678.7500 • Fax 303.678.7504
www.sens-usa.com • info@sens-usa.com
1840 Industrial Circle, Longmont, CO 80501 USA

SENS®
STORED ENERGY SYSTEMS
Our energy means business®

STOP!

Verify that all settings shown below are correct *before energizing charger*. CAUTION: Correct settings are essential to ensure proper battery performance and long battery life. *Before installation*, ensure adequate battery to charger wire gauge. Wire gauge that is too small may activate the open battery detector and the charger will shut down:

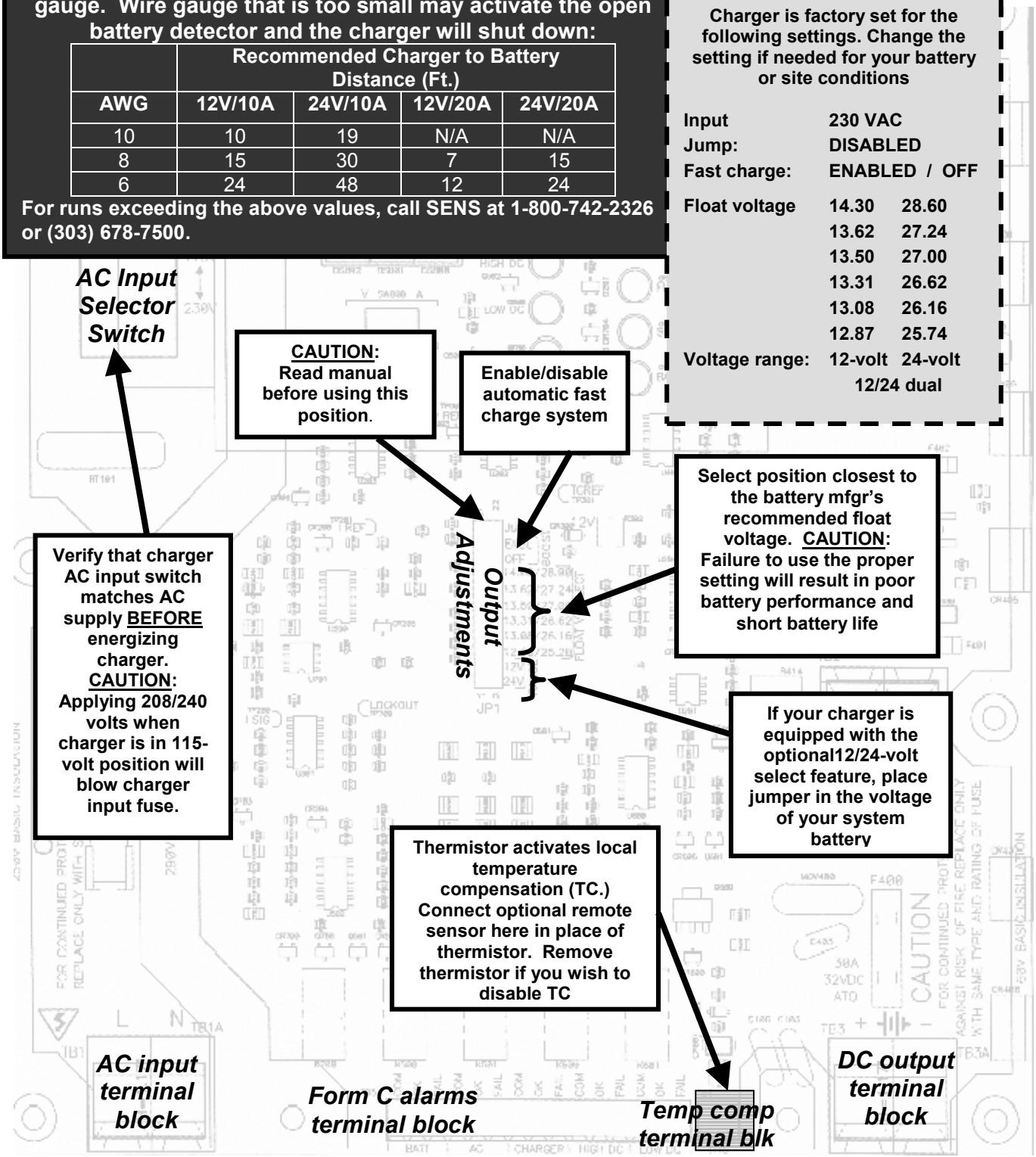
	Recommended Charger to Battery Distance (Ft.)			
AWG	12V/10A	24V/10A	12V/20A	24V/20A
10	10	19	N/A	N/A
8	15	30	7	15
6	24	48	12	24

For runs exceeding the above values, call SENS at 1-800-742-2326 or (303) 678-7500.

FACTORY SETTINGS

Charger is factory set for the following settings. Change the setting if needed for your battery or site conditions

Input	**230 VAC**	
Jump:	**DISABLED**	
Fast charge:	**ENABLED / OFF**	
Float voltage	**14.30**	**28.60**
	13.62	**27.24**
	13.50	**27.00**
	13.31	**26.62**
	13.08	**26.16**
	12.87	**25.74**
Voltage range:	**12-volt**	**24-volt**
	12/24 dual	


AC Input Selector Switch
CAUTION: Read manual before using this position.
Enable/disable automatic fast charge system
Output Adjustments
Select position closest to the battery mfgr's recommended float voltage. CAUTION: Failure to use the proper setting will result in poor battery performance and short battery life
Verify that charger AC input switch matches AC supply BEFORE energizing charger. CAUTION: Applying 208/240 volts when charger is in 115-volt position will blow charger input fuse.
If your charger is equipped with the optional12/24-volt select feature, place jumper in the voltage of your system battery
Thermistor activates local temperature compensation (TC.) Connect optional remote sensor here in place of thermistor. Remove thermistor if you wish to disable TC
AC input terminal block
Form C alarms terminal block
Temp comp terminal blk
DC output terminal block

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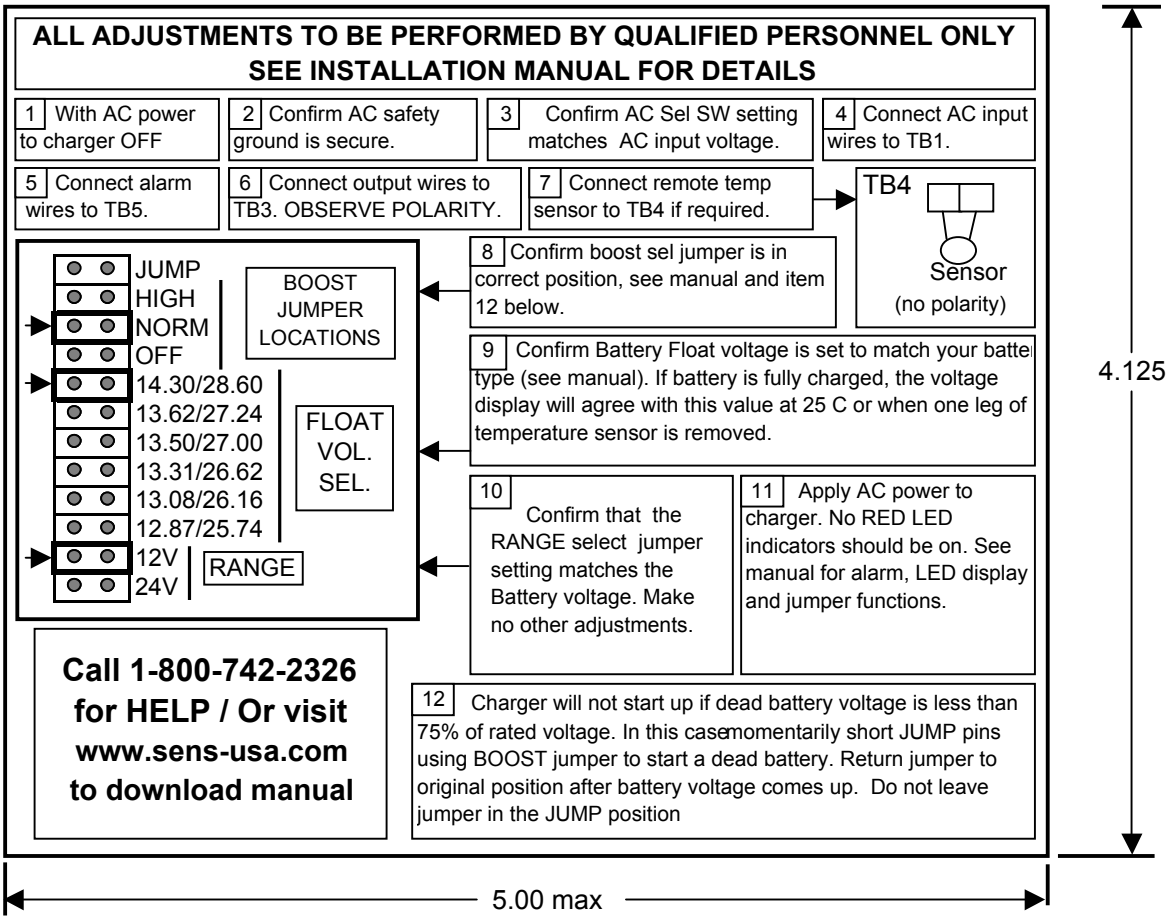
ALL ADJUSTMENTS TO BE PERFORMED BY QUALIFIED PERSONNEL ONLY
SEE INSTALLATION MANUAL FOR DETAILS
1 With AC power to charger OFF
2 Confirm AC safety ground is secure.
3 Confirm AC Sel SW setting matches AC input voltage.
4 Connect AC input wires to TB1.
5 Connect alarm wires to TB5.
6 Connect output wires to TB3. OBSERVE POLARITY.
7 Connect remote temp sensor to TB4 if required.
TB4
Sensor
(no polarity)
JUMP
HIGH
NORM
OFF
BOOST JUMPER LOCATIONS
14.30/28.60
13.62/27.24
13.50/27.00
13.31/26.62
13.08/26.16
12.87/25.74
FLOAT VOL. SEL.
12V
24V
RANGE
8 Confirm boost sel jumper is in correct position, see manual and item 12 below.
9 Confirm Battery Float voltage is set to match your batte type (see manual). If battery is fully charged, the voltage display will agree with this value at 25 C or when one leg of temperature sensor is removed.
10 Confirm that the RANGE select jumper setting matches the Battery voltage. Make no other adjustments.
11 Apply AC power to charger. No RED LED indicators should be on. See manual for alarm, LED display and jumper functions.
Call 1-800-742-2326 for HELP / Or visit www.sens-usa.com to download manual
12 Charger will not start up if dead battery voltage is less than 75% of rated voltage. In this case momentarily short JUMP pins using BOOST jumper to start a dead battery. Return jumper to original position after battery voltage comes up. Do not leave jumper in the JUMP position
4.125
5.00 max

NOTES:

1. LETTERING TO BE BLACK INK ON SILVER FOIL LABEL, MATERIAL RATED PER R/C (PGDQ2). LABEL ADHESIVE PROVIDED MUST BE SUITABLE FOR USE ON ALUMINUM & RATED FOR 80 DEG C MINIMUM.
2. PSA MATERIAL IS TO BE PROVIDED WITH RELEASE LINER.
3. RADIUS CORNERS .125" MAXIMUM.

4. THIS DRAWING NOT TO SCALE.

SENS
Our energy means business

DCN No.	105073		
Drawn By:	KL	Date:	1/13/2006
Approved By:		Date:	
DWG Name:	LABEL, INSIDE COVER, NRG10/20		
PN: 808526	DWG REV.	C	

PowerCommand® Annunciator Discrete Input or PCCNet

> Specification sheet

Our energy working for you.™

Power Generation

Description

The Universal Annunciator Module provides visual and audible indication of up to 20 separate alarm or status conditions, based on discrete (relay) inputs or network inputs. Each LED can be controlled by either a discrete wire input or by a signal on the PCCNet network sent from an external device, such as a PCC1301 or PCC2100 (version 2.4 or later) control.

In addition to the LEDs, the annunciator can control four custom relays based on signals received over the PCCNet. When one of the annunciator's discrete inputs is activated, the annunciator will broadcast that information over the network. By taking advantage of the network, discrete inputs and custom relays, the annunciator can be used as expanded I/O for a genset controller.

Easily installed in a location to give immediate notification of an alarm or warning status. Designed to give operating/monitoring personnel quick-glance status information. The module directly senses battery voltage to provide green/yellow/red alarm and status information for that parameter.

Genset controller complies with NFPA level two and three requirements when used with the display but without the annunciator panel. When used with the annunciator it meets NFPA level one requirements (emergency and standby power systems). The annunciator module can also be used for monitoring of transfer switch or other equipment status.

Features

- Visual and audible warnings of up to 20 separate alarm or status conditions.
- LEDs can be controlled either via PCCNet or discrete input.
- Status of discrete inputs is broadcast on network.
- Four custom relays can be controlled over the PCCNet network.
- Configurable LED color (red, yellow or green) and selectable horn operation allows maximum flexibility.
- Standard NFPA 110 label, field configurable for other alarm status and conditions.
- Each audible alarm is annunciated, regardless of the number of existing alarm conditions displayed.
- Sealed membrane panel design provides environmental protection for internal components and is easy to clean.
- Configurable for negative (ground) input or positive input.
- Integral DC voltage sensing.
- Flush or surface mount provisions.
- UL Listed and labeled; CSA certified; CE marked.

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S-1472c (9/07)

Specifications

Signal requirements

Positive - Input impedance is 1.82 kOhms to ground; maximum input voltage = 31 VDC.

Negative - Input impedance is 1.82 kOhms to Bat+: inputs are at Bat+ level when open.

Sink/source current threshold for detection - 150 uA minimum, 3 mA maximum.

Typical conductor size: 16 ga for 304.8 m (1000 ft)

Max conductor size for terminal: 12 ga

Relay outputs

0.2 A at 125 VAC and 1 A at 30 VDC

Network connections

18 ga twisted pair wire or Cat 5 cable. Total network length can not exceed 1219 m (4000 ft). Up to 20 nodes can be connected to the network.

Note: Any communications wire connected to the generator set should be stranded cable.

Power

Maximum consumption: 15 watts

Battery voltage

Functional range - Audible and visual conditions operational from 6.5 to 31 VDC.

Low voltage setting - 12.0 VDC for 12 Volt nominal systems; 24.0 for 24 Volt nominal systems.

High voltage setting - 16.0 Volt for 12 Volt nominal systems; 32.0 Volt for 24 Volt nominal systems.

Alarm horn

Sound level: 90 dB at 30 cm

Physical

Weight (with enclosure): 1.4 kg (3.0 lbs)

Temperature

-20 °C to +70 °C (-4 °F to +158 °F)

Humidity

10% to 95% RH (non-condensing)

Default lamp configurations

Can be configured for current NFPA 110 standard or as a replacement for Legacy (pre-2001) NFPA 110 annunciator (300-4510 or 300 4511)

		NFPA 110		
Lamp	**Description**	**Color**	**Horn**	**Flash**
DS1	Customer fault 1	Green	No	No
DS2	Customer fault 2	Amber	No	No
DS3	Customer fault 3	Red	No	No
DS4	Genset supplying load	Amber	No	No
DS5	Charger AC failure	Amber	Yes	No
DS6	Low coolant level	Amber	Yes	No
DS7	Low fuel level	Red	Yes	No
DS8	Check generator set	Amber	No	No
DS9	Not in auto	Red	Yes	Yes
DS10	Generator set running	Amber	No	No
DS11	High battery voltage	Amber	Yes	No
DS12	Low battery voltage	Red	Yes	No
DS13	Weak battery	Red	Yes	No
DS14	Fail to start	Red	Yes	No
DS15	Low coolant temp	Red	Yes	No
DS16	Pre-high engine temp	Amber	Yes	No
DS17	High engine temp	Red	Yes	No
DS18	Pre-low oil pressure	Red	Yes	No
DS19	Low oil pressure	Red	Yes	No
DS20	Overspeed	Red	Yes	No

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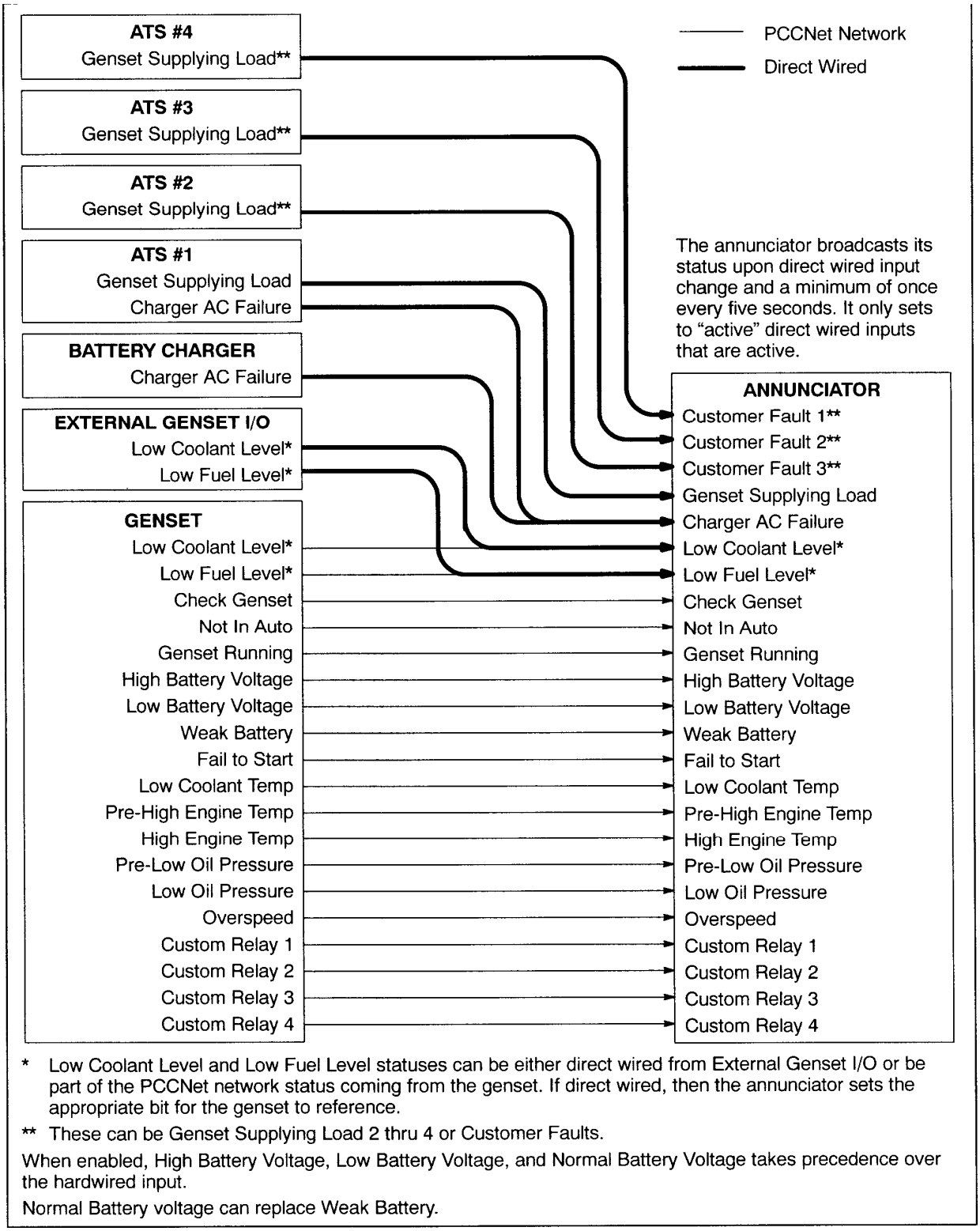
S-1472c (9/07)

Cummins Power Generation

Typical installation



* Low Coolant Level and Low Fuel Level statuses can be either direct wired from External Genset I/O or be part of the PCCNet network status coming from the genset. If direct wired, then the annunciator sets the appropriate bit for the genset to reference.

** These can be Genset Supplying Load 2 thru 4 or Customer Faults.

When enabled, High Battery Voltage, Low Battery Voltage, and Normal Battery Voltage takes precedence over the hardwired input.

Normal Battery voltage can replace Weak Battery.

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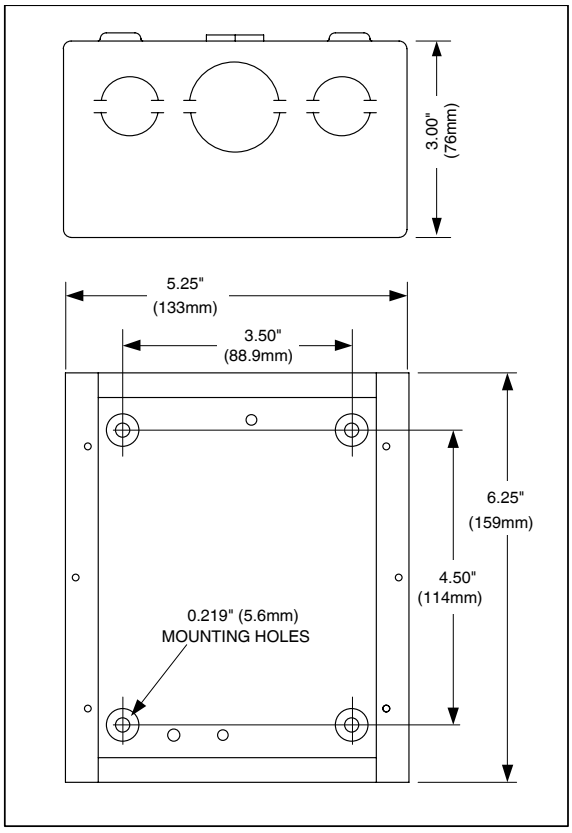
S-1472c (9/07)

Dimensions



Dimensions: in (mm)

Ordering information

Part number	Description
0300-5929-01	Panel mount
0300-5929-02	Panel with enclosure

PCCNet COMPATIBLE

See your distributor for more information.

Cummins Power Generation

Americas
1400 73rd Avenue N.E.
Minneapolis, MN 55432 USA
Phone: 763 574 5000
Fax: 763 574 5298

Europe, CIS, Middle East and Africa
Manston Park Columbus Ave.
Manston Ramsgate
Kent CT 12 5BF United Kingdom
Phone 44 1843 255000
Fax 44 1843 255902

Asia Pacific
10 Toh Guan Road #07-01
TT International Tradepark
Singapore 608838
Phone 65 6417 2388
Fax 65 6417 2399

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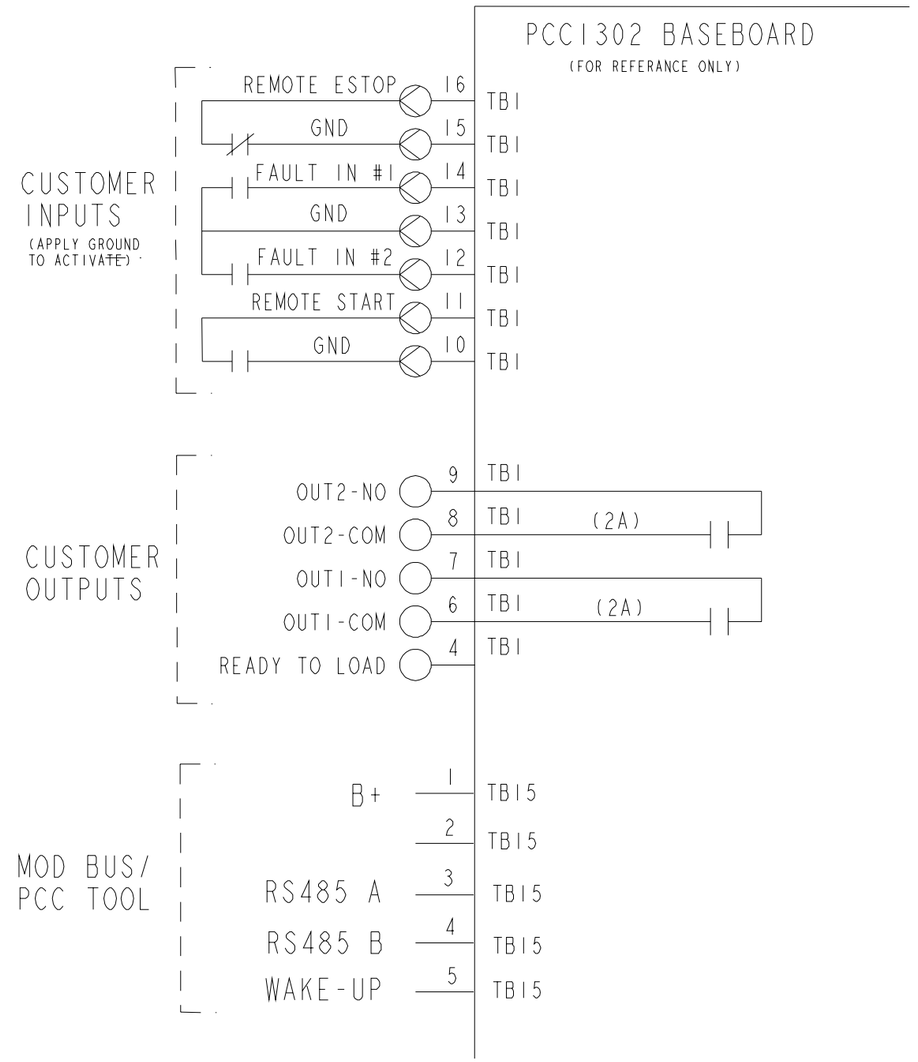
S-1472c (9/07)

Cummins Power Generation



REL NO	LTR	NO	REVISION	ZONE	DWN	CKD	APVD	DATE
FRD28860	A	1	PRODUCTION_RELEASE	-	LA	LD	DEWEY	08-18-06

NOTE:

1. TORQUE TERMINALS TO 4.4 IN/LBS (0.5 Nm).
2. WIRE SIZE, 30-12 AWG (0.14-2.5MM) (TBI).
3. WIRE TYPE, USE 60°C RATED MINIMUM. COPPER WIRE (TBI).
4. TERMINAL SCREWS ARE SLOTTED (0.6MM).
5. USE FLAT-BLADED SCREWDRIVER WITH 2.5MM BLADE.
6. STRIP WIRE LENGTH TO 6.0MM.
7. FAULT IN #2 USED FOR OPTIONAL RUPTURE BASIN INPUT.

USE FOR INTERNAL CONTROL ONLY

THIS DOCUMENT IS CONTROLLED TO MAINTAIN COMPLIANCE WITH CODES AND STANDARDS:
☒ UL ☐ CSA ☐ US TESTING ☐ OTHER _____
AND/OR TO RETAIN DESIGN RESPONSIBILITY. ☐

ANY CHANGES OR DEVIATIONS TO THIS DOCUMENT MUST BE APPROVED BY THE COORDINATOR LISTED.

FACILITY FRIDLEY DATE 08-18-06
SIGNATURE
FACILITY DATE
SIGNATURE

QTY	ITEM	PART NO	DESCRIPTION OR MATERIAL

UNLESS OTHERWISE SPECIFIED, ALL DIMENSIONS ARE IN MILLIMETERS

DIM		HOLE	
X	± 1	0.00- 4.99	+0.15/-0.08
.X	± 0.8	5.00- 9.99	+0.20/-0.10
.XX	± 0.38	10.00-17.49	+0.25/-0.13
		17.50-24.99	+0.30/-0.13

ANG TOL: ± 1.0° SCALE: 1/1

SIM TO .

DO NOT SCALE PRINT

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DWN	L_ARNOLD
CKD	L_DEWEY
APVD	L_DEWEY
DATE	08-18-06

FOR INTERPRETATION OF DIMENSIONING AND TOLERANCING, SEE ASME Y14.5M-1994

FIRST USED ON: PCC1302

SITE CODE: PGF

CUMMINS POWER GENERATION
1400 73RD AVENUE NE, MINNEAPOLIS, MN 55432

CONNECTION_DIAGRAM
(CUST)

DWG SIZE		SHEET	DWG REV
B	0620_0292	1 OF 1	A

Pro/ENGINEER

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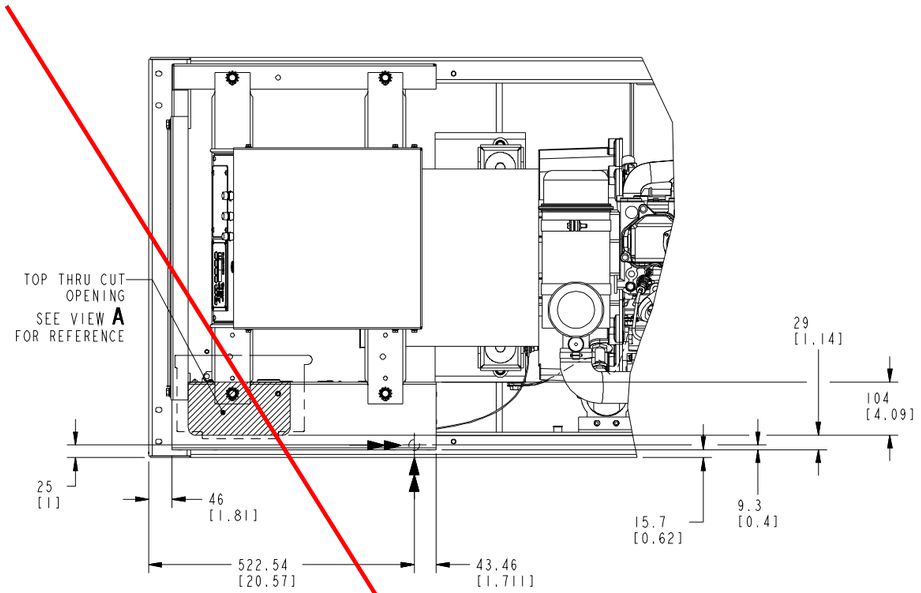
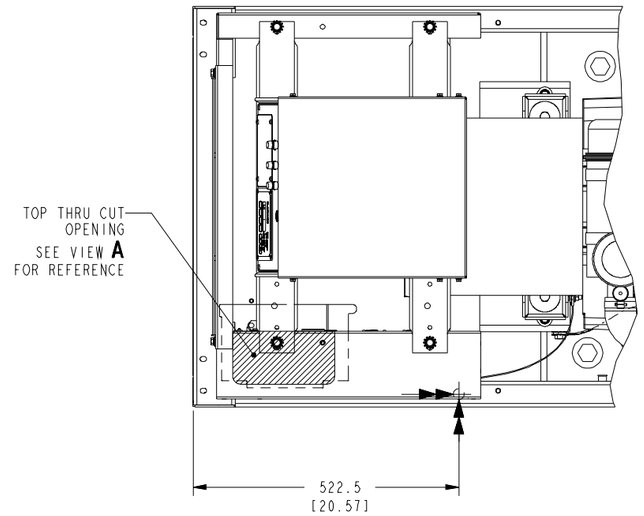
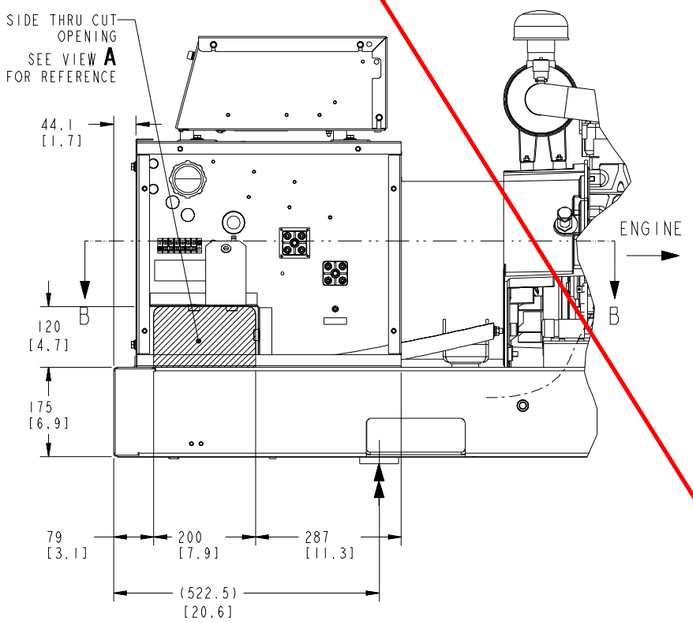
REL NO	LTR	NO	REVISION	ZONE	DRN	CKD	APVD	DATE
FRD33983	A	1	PRODUCTION_RELEASE	-	TO	LD	E_WANG	10-01-07



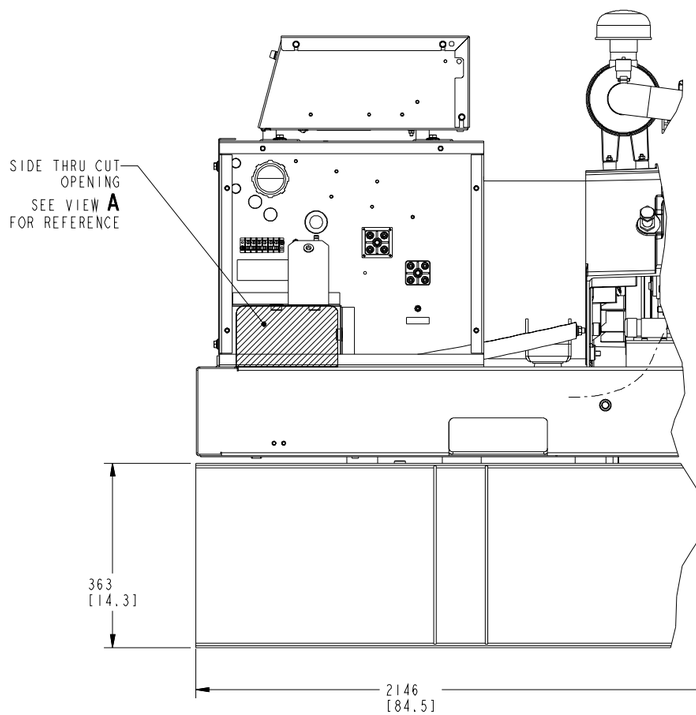


NOTES:

1. DIMENSIONS SHOWN IN [ ] ARE IN INCHES.
2. FOUNDATION REFERENCE POINT SHOWN BY THIS SYMBOL ⟶ AND RELATED DIMENSIONS ARE GENERATOR FRAME SPECIFIC. (REFER TO GENERATOR SET OUTLINE DRAWING).



SKID BASE
WITHOUT FUEL TANK
SCALE 3/16



SKID BASE
WITH FUEL TANK
SCALE 3/16

QTY	ITEM	PART NO	DESCRIPTION OR MATERIAL

UNLESS OTHERWISE SPECIFIED, ALL DIMENSIONS ARE IN MILLIMETERS

DIM		HOLE	
X	± 1	0.00- 4.99	+0.15/-0.08
.X	± 0.8	5.00- 9.99	+0.20/-0.10
.XX	± 0.38	10.00-17.49	+0.25/-0.13
		17.50-24.99	+0.30/-0.13

ANG TOL: ± 1.0°

SCALE: 3/16

SIM TO 0500_4528

DO NOT SCALE PRINT

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DRN	T_OLSON
CKD	L_DEWEY
APVD	E_WANG
DATE	10-01-07

FOR INTERPRETATION OF DIMENSIONING AND TOLERANCING, SEE ASME Y14.5M-1994

FIRST USED ON: DSKAA,AB,BA,CA

SITE CODE: PGF

CUMMINS POWER GENERATION
1400 73RD AVENUE NE, MINNEAPOLIS, MN 55432

CIRCUIT BRKR OUTLINE

DRG SIZE: D | 0500_4935 | SHEET 1 of 2 | DRG REV: A

Pro/ENGINEER

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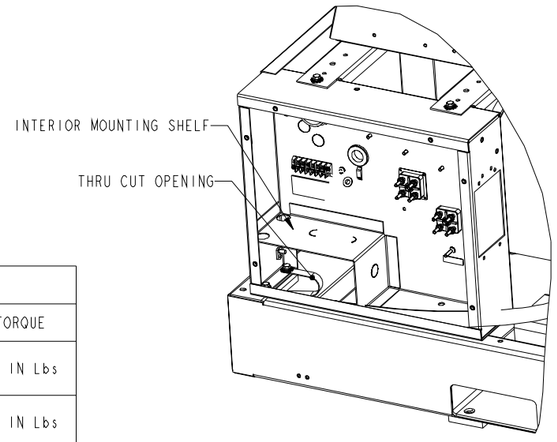
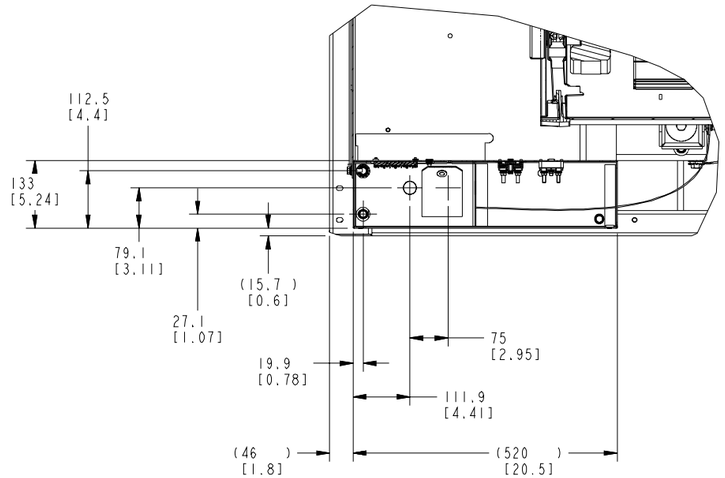
REL NO	LTR	NO	REVISION	ZONE	DRN	CKD	APVD	DATE
FRD33983	A	1	PRODUCTION_RELEASE	-	TO	LD	E_WANG	10-01-07



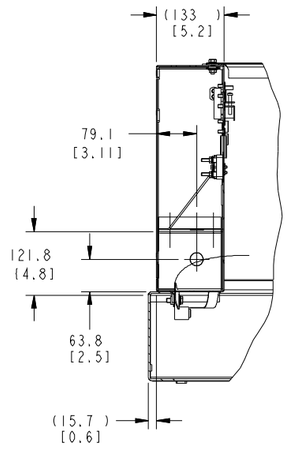
VIEW A
ISO ORIENTATION
SCALE 3/16

TABULATION

LUG	MFG MODEL	AMPERAGE RANGE	WIRE RANGE	TORQUE
	SQUARE D QO 240V	40-70A 2-POLE	#14-#2 AWG (1)	45 IN Lbs
	SQUARE D QO 240V	80-100A 2-POLE	#14-2/0AWG (1)	45 IN Lbs
	QDL 240V	250A 2-POLE	#4-300 KCMIL	250 IN Lbs
	QDL 240V	250A 3-POLE	#4-300 KCMIL	250 IN Lbs
	SQUARE D HGL	15-90 A 3-POLE	#14 - #10 AWG	50 IN LBS
			#8-3/0 AWG	120 IN LBS



SECTION B-B
SCALE 3/16



SECTION C-C
SCALE 3/16

OUTPUT BOX
DETAIL

QTY	ITEM	PART NO	DESCRIPTION OR MATERIAL

UNLESS OTHERWISE SPECIFIED, ALL DIMENSIONS ARE IN MILLIMETERS

DIM		HOLE	
	X ± 1		0.00- 4.99 +0.15/-0.08
	.X ± 0.8		5.00- 9.99 +0.20/-0.10
	.XX± 0.38		10.00-17.49 +0.25/-0.13
			17.50-24.99 +0.30/-0.13

ANG TOL: ± 1.0° SCALE: 1/1

SIM TO 0500_4528
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DRN T_OLSON
CKD L_DEWEY
APVD E_WANG
DATE 10-01-07
FOR INTERPRETATION OF DIMENSIONING AND TOLERANCING, SEE ASME Y14.5M-1994
FIRST USED ON DSKAA,AB,BA,CA

SITE CODE PGF

CUMMINS POWER GENERATION
1400 73RD AVENUE NE. MINNEAPOLIS, MN 55432

CIRCUIT BRKR OUTLINE
.

DWG SIZE D | 0500_4935 | SHEET 2 of 2 | DWG REV A

Pro/ENGINEER

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PowerCommand 1.1
(FOR REFERENCE ONLY)

REL NO	LTR	NO	REVISION	ZONE	DWN	CKD	APVD	DATE
ECO-100070	B	1	SEE ECO	-	AGJ	LD	L_DEWEY	20JUN08

NOTES:

1. CUSTOMER INPUT FAULTS 1 AND 2 ARE NOT AVAILABLE WITH SOME GENERATOR SET OPTIONS.
2. SEE 0630_3607 FOR WIRING OF SENSE LEADS TO THE GENERATOR AND CT TERMINALS.
3. REMOVE JUMPER WHEN REMOTE E-STOP IS USED.
4. SEE SHEET 2 FOR CUSTOMER OUTPUT CONNECTIONS.
5. LEAD K1/ACT+ CONNECTS TO FUEL SOLENOID OR ELECTRONIC GOVERNOR ACTUATOR.
6. "OPTIONAL, NOT ON ALL GENSETS"

UNLESS OTHERWISE SPECIFIED, ALL DIMENSIONS ARE IN MILLIMETERS				QTY	ITEM	PART NO	DESCRIPTION OR MATERIAL	
DIM: X ±1, .X ±0.8, .XX± 0.38 — HOLE: 0.00- 4.99 +0.15/-0.08; 5.00- 9.99 +0.20/-0.10; 10.00-17.49 +0.25/-0.13; 17.50-24.99 +0.30/-0.13				SIM TO 0630_2936	DWN S_PRABHUDESAI		CUMMINS POWER GENERATION 1400 73RD AVENUE NE, MINNEAPOLIS, MN 55432	
ANG TOL: ± 1.0°	SCALE: 1/1			DO NOT SCALE PRINT	CKD N_VAIDYA		WD-GENSET	
- CONFIDENTIAL - PROPERTY OF CUMMINS POWER GENERATION GROUP					APVD L_DEWEY			
FOR INTERPRETATION OF DIMENSIONING AND TOLERANCING, SEE ASME Y14.5M-1994				FIRST USED ON DSKAA,AB,BA,CA	DATE 08-02-07	SITE CODE PGF	DWG SIZE D	0630_3627 SHEET 1 of 2 DWG REV B

Pro/ENGINEER

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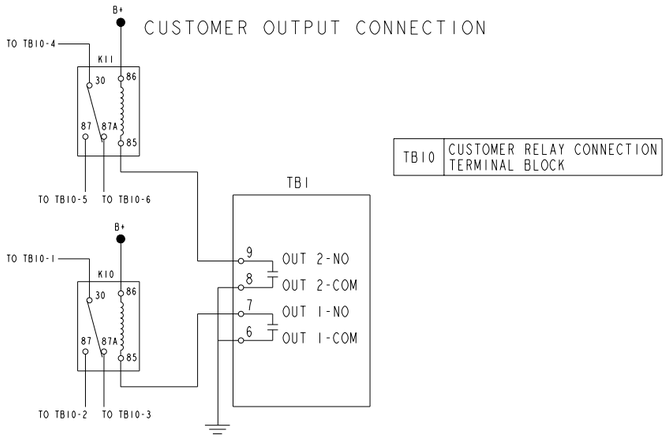
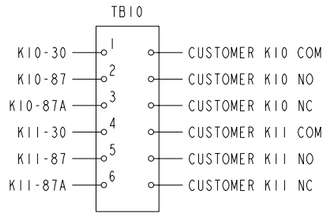
REL NO	LTR	NO	REVISION	ZONE	DWN	CKD	APVD	DATE
ECO-100070	B	1	SEE ECO	-	AGJ	LD	L_DEWEY	20JUN08

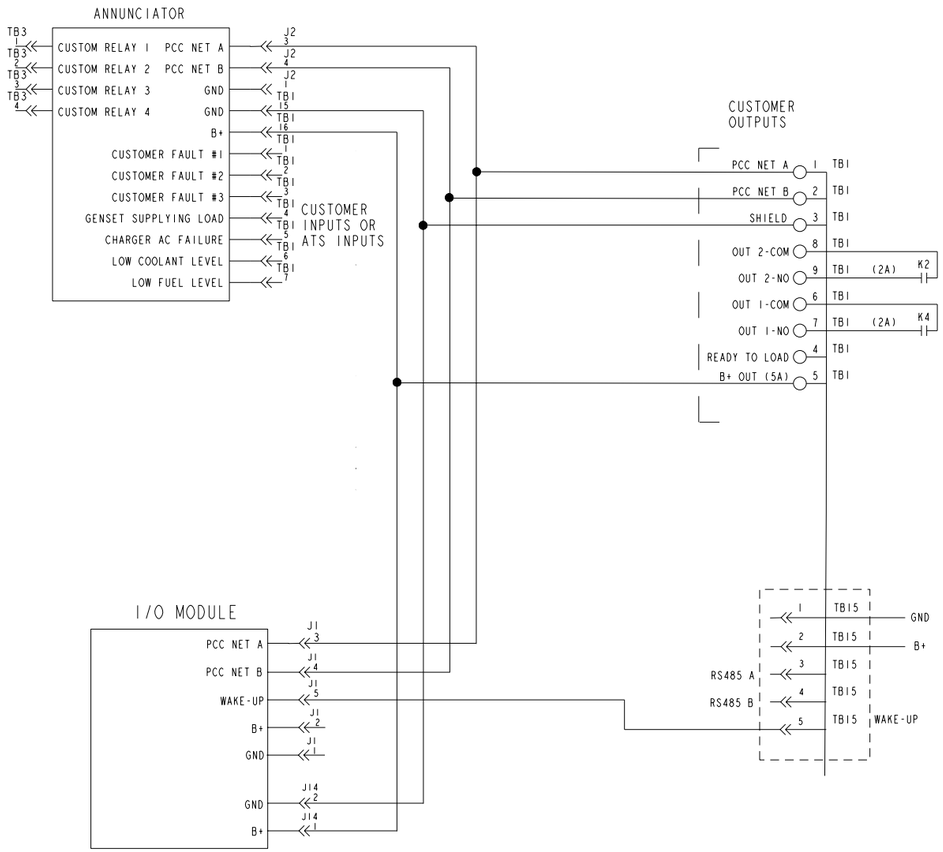
CUSTOMER OUTPUT CONNECTION



TB10	CUSTOMER RELAY CONNECTION TERMINAL BLOCK



ANNUNCIATOR AND I/O MODULE



QTY	ITEM	PART NO	DESCRIPTION OR MATERIAL

UNLESS OTHERWISE SPECIFIED, ALL DIMENSIONS ARE IN MILLIMETERS

DIM: X ± 1 | .X ± 0.8 | .XX ± 0.38

HOLE: 0.00- 4.99 +0.15/-0.08 | 5.00- 9.99 +0.20/-0.10 | 10.00-17.49 +0.25/-0.13 | 17.50-24.99 +0.30/-0.13

ANG TOL: ± 1.0° | SCALE: 1/1

SIM to 0630_2936

DO NOT SCALE PRINT

- CONFIDENTIAL - PROPERTY OF CUMMINS POWER GENERATION GROUP

DRN S_PRABHUDESAI | CKD N_VAIDYA | APVD L_DEWEY | DATE 08-02-07

FOR INTERPRETATION OF DIMENSIONING AND TOLERANCING, SEE ASME Y14.5M-1994

FIRST USED ON DSKAA,AB,BA,CA

SITE CODE PGF

CUMMINS POWER GENERATION
1400 73RD AVENUE NE, MINNEAPOLIS, MN 55432

WD-GENSET

SIZE D | DWG 0630_3627 | SHEET 2 of 2 | DWG REV B

Pro/ENGINEER

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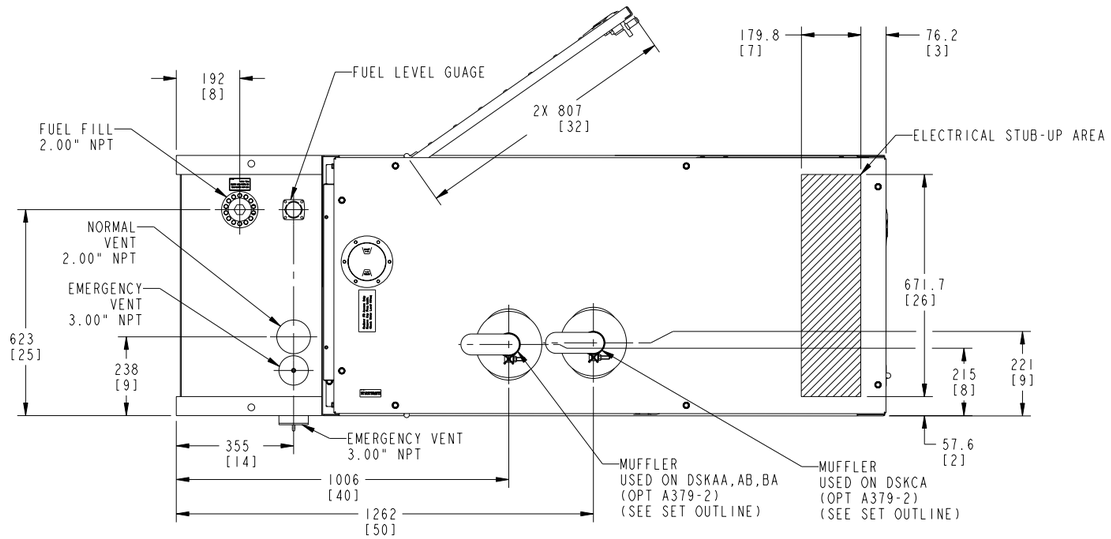
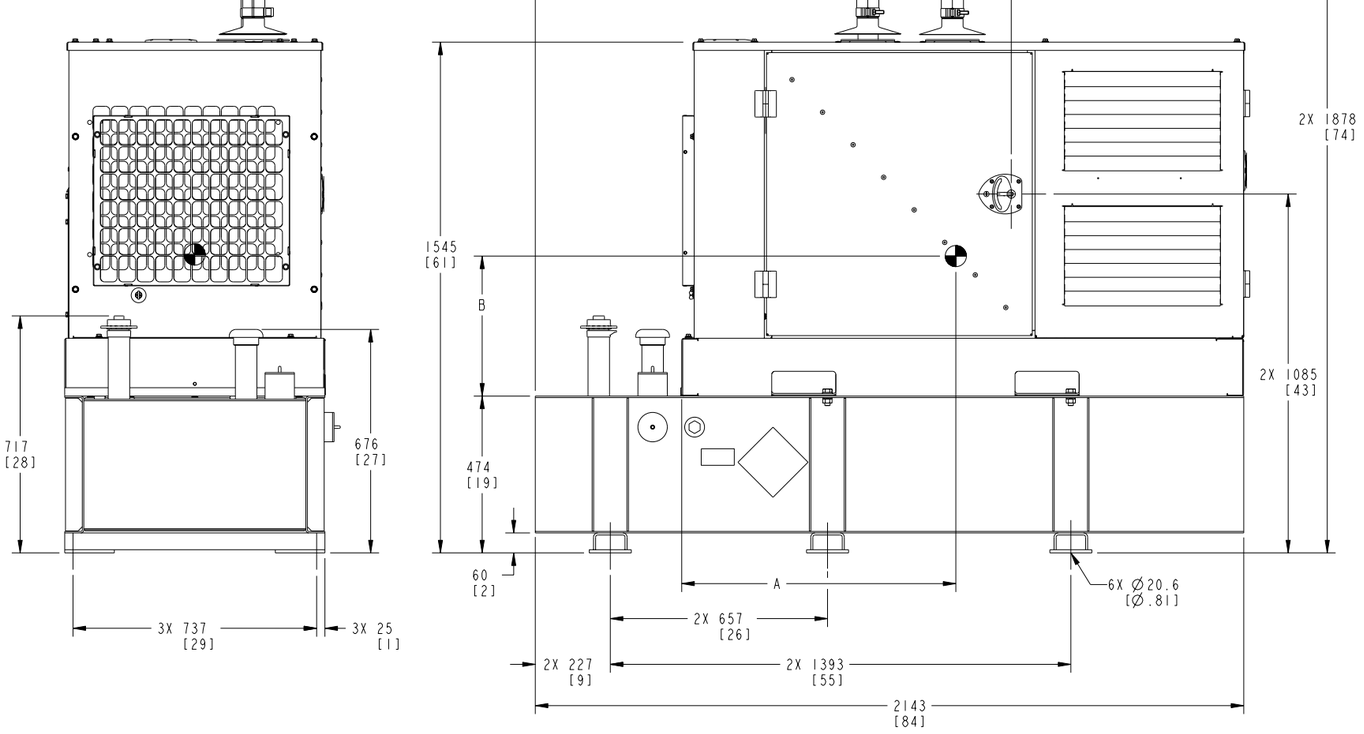
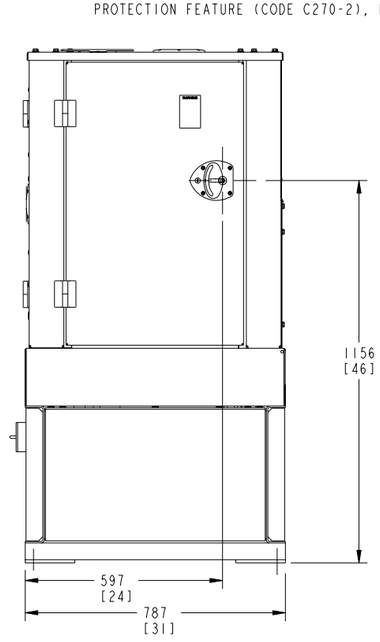
Pro/ENGINEER

REL NO	LTR	NO	REVISION	DWN	CKD	APVD	DATE
ECO-102337	E	1	ADDED NOTES 3 & 4	DB	EW	EW	30OCT08







NOTES:
1. DIMENSIONS IN [ ] ARE IN INCHES.
2. SEE WEATHER ENCLOSURE OUTLINE 0500-4849 OR 0500-4850 FOR ADDITIONAL DETAILS.
3. THE WEIGHTS LISTED IN THE FOLLOWING TABULATION INCLUDE THE GENSET, ENCLOSURE AND THE OVERFLOW PROTECTION FEATURE (CODE C270-2).

TABULATION

MODEL	FEATURE CODE	COMPLETE GENSET	WEIGHT kgs [LBS]	CENTER OF GRAVITY DIM A	CENTER OF GRAVITY DIM B
DSKAA/AB	F182-2	BASE GENERATOR	801 [1766]	784 [30.9]	277 [10.9]
DSKAA/AB	F182-2	EXTENDED STACK	820 [1808]	797 [31.4]	279 [11.0]
DSKBA	F182-2	BASE GENERATOR	860 [1896]	796 [31.3]	276 [10.9]
DSKBA	F182-2	EXTENDED STACK	881 [1942]	814 [32.0]	278 [10.9]
DSKCA	F182-2	BASE GENERATOR	883 [1947]	742 [29.2]	283 [11.1]
DSKCA	F182-2	EXTENDED STACK	910 [2006]	772 [30.4]	285 [11.2]
DSKAA/AB	F216-2	BASE GENERATOR	739 [1629]	777 [30.6]	244 [9.6]
DSKAA/AB	F216-2	EXTENDED STACK	758 [1671]	791 [31.1]	247 [9.7]
DSKBA	F216-2	BASE GENERATOR	798 [1759]	791 [31.1]	246 [9.7]
DSKBA	F216-2	EXTENDED STACK	819 [1806]	810 [31.9]	249 [9.8]
DSKCA	F216-2	BASE GENERATOR	821 [1810]	732 [28.8]	254 [10.0]
DSKCA	F216-2	EXTENDED STACK	848 [1870]	765 [30.1]	258 [10.2]
DSKAA/AB	F172-2 QSI	BASE GENERATOR	814 [1794]	780 [30.7]	292 [11.5]
DSKAA/AB	F172-2 QSI	EXTENDED STACK	833 [1836]	793 [31.2]	294 [11.6]
DSKBA	F172-2 QSI	BASE GENERATOR	873 [1925]	792 [31.2]	291 [11.4]
DSKBA	F172-2 QSI	EXTENDED STACK	894 [1971]	810 [31.9]	292 [11.5]
DSKCA	F172-2 QSI	BASE GENERATOR	896 [1975]	738 [29.0]	297 [11.7]
DSKCA	F172-2 QSI	EXTENDED STACK	923 [2035]	769 [30.3]	299 [11.8]

4. TO OBTAIN THE WEIGHT OF A COMPLETE GENSET WITHOUT THE OVERFLOW PROTECTION FEATURE (CODE C270-2), REFER TO DRAWING # 0500-4951.

UNLESS OTHERWISE SPECIFIED, ALL DIMENSIONS ARE IN MILLIMETERS
DIM: X ±1; .X ±0.8; .XX± 0.38
HOLE: 0.00- 4.99 +0.15/-0.08; 5.00- 9.99 +0.20/-0.10; 10.00-17.49 +0.25/-0.13; 17.50-24.99 +0.30/-0.13
ANG TOL: ± 0.5° SCALE: 1/1
SIM TO 0179_0699
DO NOT SCALE PRINT
- CONFIDENTIAL - PROPERTY OF CUMMINS POWER GENERATION GROUP
DWN D_BAACK
CKD A_JOHNSON
APVD Z_MOGES
DATE 12-07-07
FOR INTERPRETATION OF DIMENSIONING AND TOLERANCING, SEE ASME Y14.5M-1994
FIRST USED ON DSKAA,AB,BA,CA
SITE CODE PGF
CUMMINS POWER GENERATION
TANK OUTLINE
(WEATHER ENCLOSURE)
DWG SIZE D
0500_4952
SHEET 1 of 1
DWG REV E

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REL NO	LTR	NO	REVISION	ZONE	DWN	CKD	APVD	DATE
ECO-100724	C	1	ADD CG DIMS	-	AGJ	DC	E_WANG	18JUL08
		2	REVISED TABULATION TABLE	-	AGJ	DC	E_WANG	18JUL08

NOTE:
1. DIMENSIONS SHOWN IN [ ] ARE INCHES.
2. Ø20.6 [.812] HOLES (4 PLACES) ARE MARKED BY △ FOR OPTIONAL SUBBASE TANK.
3. REFER TO HEATER INSTALLATION DRAWING FOR ELECTRICAL CONNECTION DETAILS.
4. SEE SUBBASE FUEL TANK DRAWING FOR AVAILABLE STUB-UP AREA WHEN SUBBASE FUEL TANK IS USED.

FUEL RETURN (3/16" HOSE BARB)

DETAIL A

OIL CHECK

DETAIL B

DETAIL C

FUEL SUPPLY (3/8" HOSE BARB)

EXHAUST OUTLET 2.00" (STD)

BATTERY (OPTIONAL)

562 [22.1]

737 [29]

787 [31]

25 [1]

AIR FLOW

573 [22.6]

346 [13.6]

NOTE 5

ELECTRICAL STUB-UP (LOWER)

FUEL STUB-UP 150 X 250 [5.9] [9.8]

471 [18.5]

RADIATOR FILL

40 AMP CB

1394 [54.9]

TABULATION					
MODEL	PHASE	GEN SET DRY WT kgs [LBS]	GEN SET WET WT kgs [LBS]	DIM A	DIM B
DSKBA	BASE GENERATOR	549 [1210]	568 [1252]	861 [33.9]	398 [15.7]
DSKBA	EXTENDED STACK	570 [1256]	589 [1298]	886 [34.9]	397 [15.6]

POWER COMMAND CONTROL 1.1 (H700-2)

239 [9.4]

297 [11.7]

3X Ø22.5 [0.89] ELECTRICAL CONNECTION

95 [3.7]

SEE DETAIL A

COOLANT HEATER (OPTIONAL)(NOTE 3)

829 [32.6]

OIL CHECK SEE DETAIL B

826 [32.5]

670 [26.4]

℄ CRANK

928 [36.5]

708 [27.9] EXHAUST

280 [11.0]

B

364 [14.3]

261.07 [10.3]

100 [3.9]

SEE DETAIL C

OIL DRAIN (3/8" NPT)

51 [2]

75 [3]

441 [17.4]

485.7 [19.12]

495 [19.5]

A

1177 [46.3]

1467 [57.7]

1700 [66.9]

FUEL RETURN

FUEL SUPPLY (SEE DETAIL C)

217 [8.5]

245 [9.6]

314 [12.4]

548.7 [21.6]

COOLANT DRAIN 3/8" NPT

QTY	ITEM	PART NO	DESCRIPTION OR MATERIAL

UNLESS OTHERWISE SPECIFIED, ALL DIMENSIONS ARE IN MILLIMETERS

DIM: X ± 1; .X ± 0.8; .XX ± 0.38

HOLE: 0.00- 4.99 +0.15/-0.08; 5.00- 9.99 +0.20/-0.10; 10.00-17.49 +0.25/-0.13; 17.50-24.99 +0.30/-0.13

ANG TOL: ± 1.0° SCALE: 1/8

SIM to 0500_4222

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FOR INTERPRETATION OF DIMENSIONING AND TOLERANCING, SEE ASME Y14.5M-1994

FIRST USED ON DSKBA

DRN T_OLSON

CKD S_BARR

APVD E_WANG

DATE 10_08_07

SITE CODE PGF

CUMMINS POWER GENERATION
1400 73RD AVENUE NE, MINNEAPOLIS, MN 55432

ENG/GEN OUTLINE

DWG SIZE D | 0500_4864 | SHEET 1 of 2 | DWG REV C

Pro/ENGINEER

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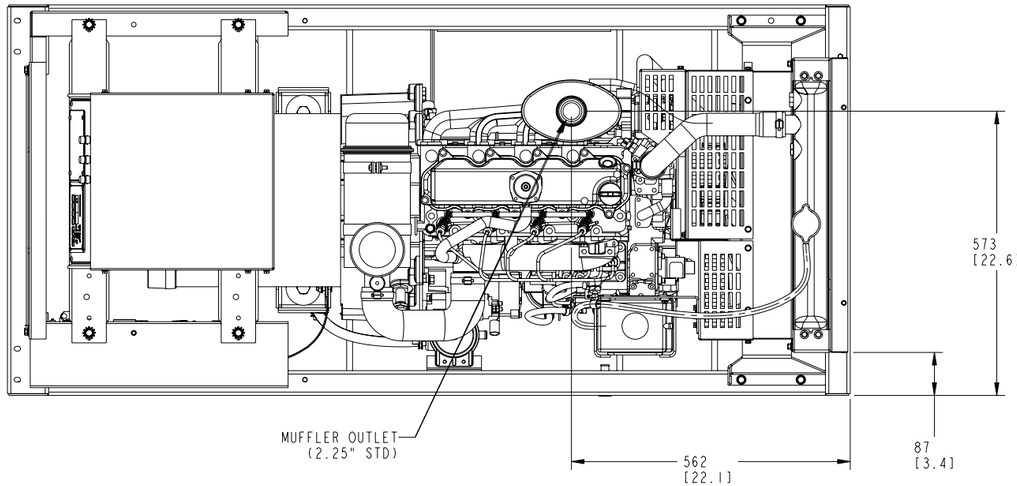
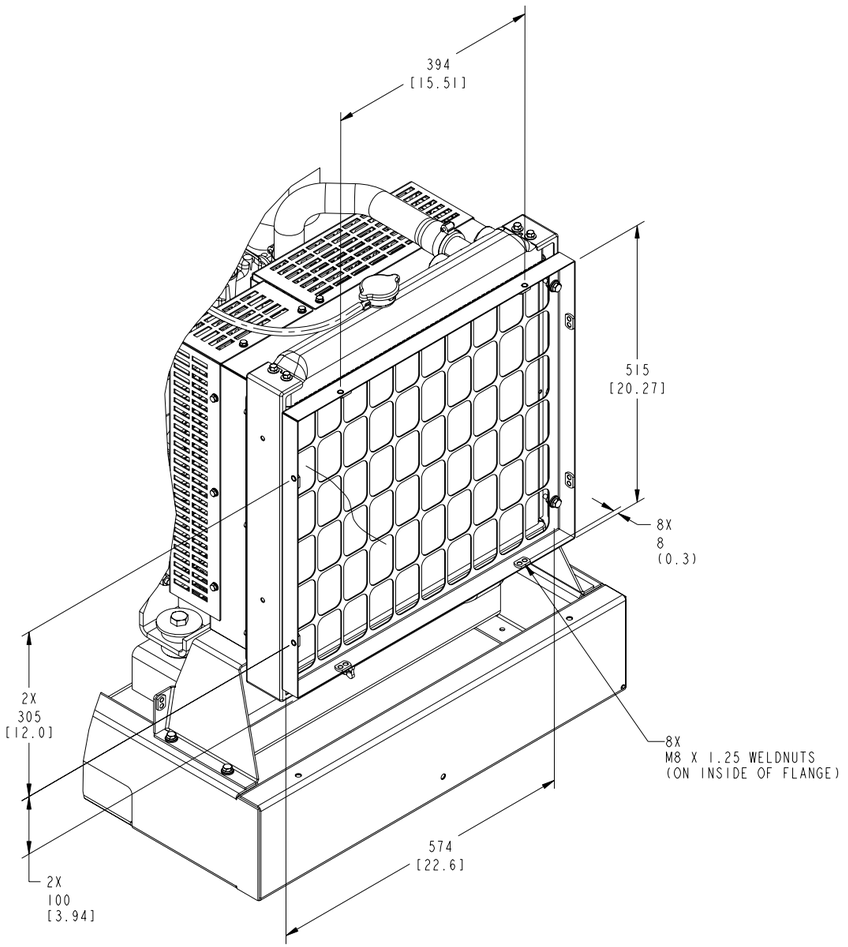
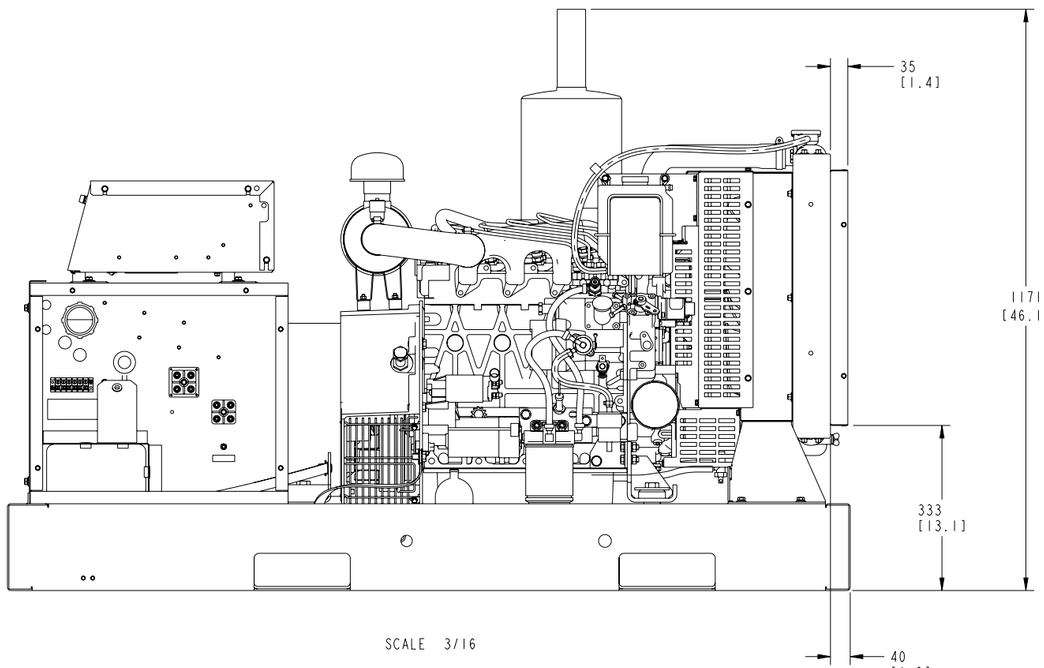
REL NO	LTR	NO	REVISION	ZONE	DWN	CKD	APVD	DATE
ECO-100724	C	-	-----	-	AGJ	DC	S_BARR	18JUL08







SCALE 3/16

QTY	ITEM	PART NO	DESCRIPTION OR MATERIAL

UNLESS OTHERWISE SPECIFIED, ALL DIMENSIONS ARE IN MILLIMETERS

DIM	±	HOLE	±
X	1	0.00- 4.99	+0.15/-0.08
.X	0.8	5.00- 9.99	+0.20/-0.10
.XX	0.38	10.00-17.49	+0.25/-0.13
		17.50-24.99	+0.30/-0.13

ANG TOL: ± 1.0° SCALE: 1/8

SIM TO 0500_4222 DO NOT SCALE PRINT

- CONFIDENTIAL - PROPERTY OF CUMMINS POWER GENERATION GROUP

DWN T_OLSON
CKD S_BARR
APVD E_WANG
DATE 10_08_07

FOR INTERPRETATION OF DIMENSIONING AND TOLERANCING, SEE ASME Y14.5M-1994

FIRST USED ON DSKBA

CUMMINS POWER GENERATION
1400 73RD AVENUE NE, MINNEAPOLIS, MN 55432

ENG/GEN OUTLINE

SITE CODE PGF

DWG SIZE D | 0500_4864 | SHEET 2 of 2 | DWG REV C

Pro/ENGINEER

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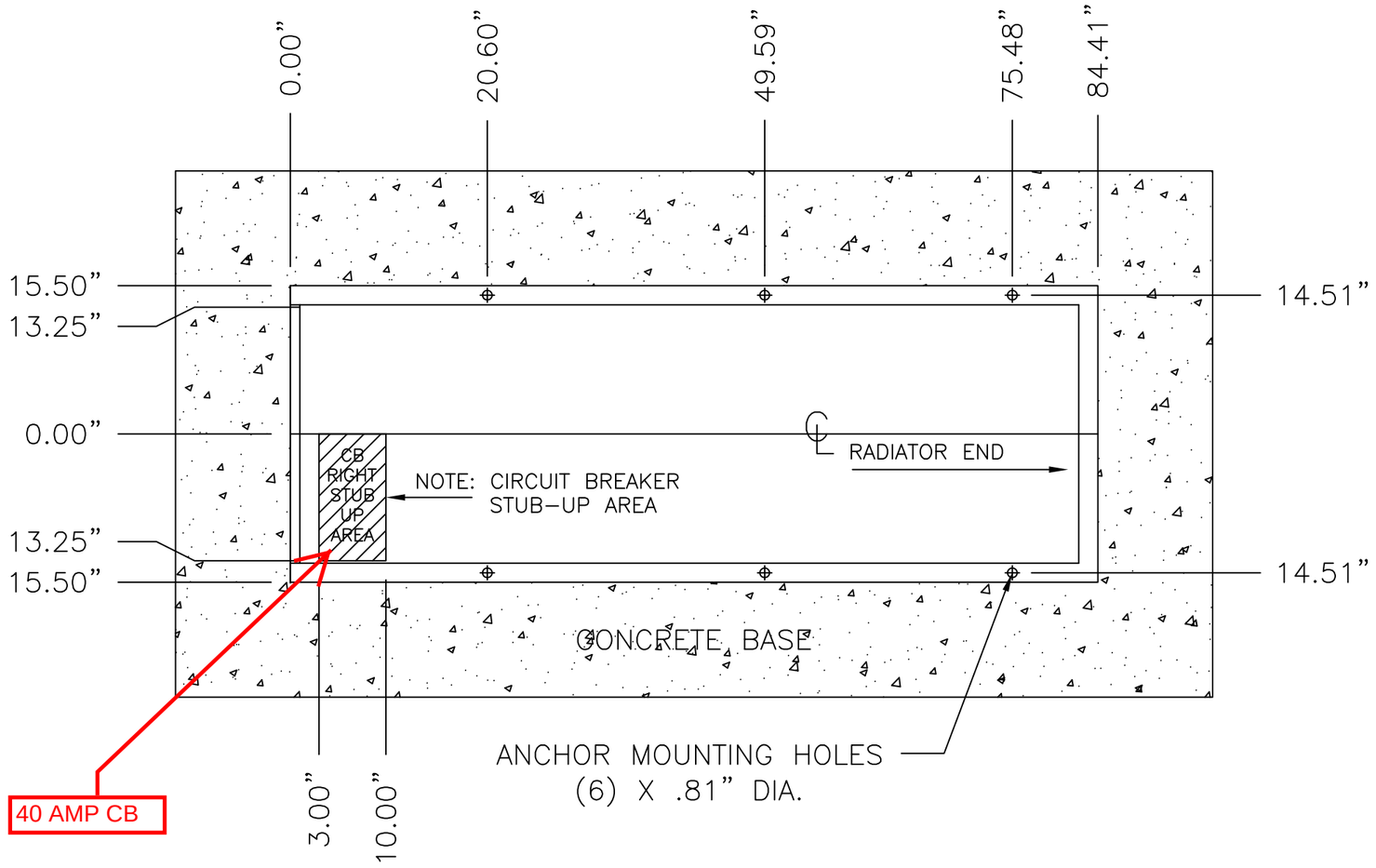
REVISIONS				
ZONE	REV	DESCRIPTION	DATE	APPROVED



NOTE: SUGGESTED CONCRETE PER IBC
NOTE: THE MINIMUM CLEARANCE TO ANY STRUCTURE FROM THE ENCLOSURE AIR INLET SHALL BE 6.5 FEET. FROM THE RADIATOR AIR OUTLET SHALL BE 6.5 FEET. FOR SERVICE SPACE AROUND THE GENSET 5 FEET.

REF: GENERATOR SET DRAWING 0500-4864
REF: GENSET/FUEL TANK DRAWING 0500-4952
REF: CIRCUIT BREAKER DRAWING 0500-4935

UNLESS OTHERWISE SPECIFIED, ALL DIMENSIONS ARE IN INCHES

TOLERANCES:
FRACTIONAL: 1/4
.X: .06
.XX: .03
.XXX: .01
ANGLES: .5°

REFERENCES
0500-4866
0500-4952
0500-4935

PREP. BY:	KDU	04/09/10
CHKD BY:	–	–
MODIFIED BY:	–	–

FINISH: N/A

ENGINE FAMILY: DSK/V3300

F182/C266

Cummins Rocky Mountain
8211 E 96th AVE
HENDERSON, COLORADO 80640
PH: 303-287-0201
FAX: 303-287-4837

SITE NAME: –	CONTACT NAME: –	CUSTOMER PROJECT NO: –
CONTRACTOR NAME: –	CONTACT NO: –	CRM PROJECT NO: –

TITLE: 20 KW GENERATOR SET
0500-4952 GENSET/FUEL TANK

SIZE: C | DWG NO: DSKBA ELECTRICAL STUB-UP | REV A
SCALE: NONE | DO NOT SCALE PRINT | SHEET 1 OF 1

THIS DRAWING CONTAINS INFORMATION THAT IS PROPRIETARY TO CRM, THIS INFORMATION IS TO BE HELD IN CONFIDENCE. NO DISCLOSURE OR OTHER USE OF THIS DRAWING IS TO BE MADE WITHOUT PRIOR WRITTEN CONSENT OF CRM.

TB-C-07-REV-D

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Warranty Statement

Our energy working for you.™

Cummins Power Generation

Global Commercial Warranty Statement

Commercial Generating Set

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Our energy working for you.™

Power Generation

Limited Warranty

Commercial Generating Set

This limited warranty applies to all Cummins Power Generation® branded commercial generating sets and associated accessories (hereinafter referred to as "Product").

This warranty covers any failures of the Product, under normal use and service, which result from a defect in material or factory workmanship.

Warranty Period:

The warranty start date† is the date of initial start up, first rental, demonstration or 18 months after factory ship date, whichever is sooner. See table for details.

Continuous Power (COP) is defined as being the maximum power which the generating set is capable of delivering continuously whilst supplying a constant electrical load when operated for an unlimited number of hours per year. No overload capability is available for this rating.

Prime Power (PRP) is defined as being the maximum power which a generating set is capable of delivering continuously whilst supplying a variable electrical load when operated for an unlimited number of hours per year. The permissible average power output over 24 hours of operation shall not exceed 70% of the PRP. For applications requiring permissible average output higher than stated, a COP rating should be used.

Limited-Time Running Power (LTP) is defined as the maximum power available, under the agreed operating conditions, for which the generating set is capable of delivering for up to 500 hours of operation per year.

Emergency Standby Power (ESP) is defined as the maximum power available during a variable electrical power sequence, under the stated operating conditions, for which a generating set is capable of delivering in the event of a utility power outage or under test conditions for up to 200 hours of operation per year. The permissible average power output over 24 hours of operation shall not exceed 70% of the ESP.

Base Warranty Coverage Duration (Whichever occurs first)

Rating	Months	Max. Hours
COP	12	Unlimited
PRP	12	Unlimited
LTP	12	500 hrs
ESP	24	400 hrs

† Warranty start date for designated rental and oil and gas model Products is determined to be date of receipt of Product by the end customer.

Cummins Power Generation® Responsibilities:

In the event of a failure of the Product during the warranty period due to defects in material or workmanship, Cummins Power Generation® will only be responsible for the following costs:

- All parts and labor required to repair the Product.
- Reasonable travel expenses to and from the Product site location.
- Maintenance items that are contaminated or damaged by a warrantable failure.

Owner Responsibilities:

The owner will be responsible for the following:

- Notifying Cummins Power Generation® distributor or dealer within 30 days of the discovery of failure.
- Installing, operating, commissioning and maintaining the Product in accordance with Cummins Power Generation®'s published policies and guidelines.
- Providing evidence for date of commissioning.
- Providing sufficient access to and reasonable ability to remove the Product from the installation in the event of a warrantable failure.

In addition, the owner will be responsible for:

- Incremental costs and expenses associated with Product removal and reinstallation resulting from non-standard installations.
- Costs associated with rental of generating sets used to replace the Product being repaired.

- Costs associated with labor overtime and premium shipping requested by the owner.
- All downtime expenses, fines, all applicable taxes, and other losses resulting from a warrantable failure.

Limitations:

This limited warranty does not cover Product failures resulting from:

- Inappropriate use relative to designated power rating.
- Inappropriate use relative to application guidelines.
- Normal wear and tear.
- Improper and/or unauthorized installation.
- Negligence, accidents or misuse.
- Lack of maintenance or unauthorized repair.
- Noncompliance with any Cummins Power Generation® published guideline or policy.
- Use of improper or contaminated fuels, coolants or lubricants.
- Improper storage before and after commissioning.
- Owner's delay in making Product available after notification of potential Product problem.
- Use of steel enclosures within 60 miles of the coast of salt water when aluminum or an alternate non-corrosive material enclosure option is available.
- Replacement parts and accessories not authorized by Cummins Power Generation®.
- Use of Battle Short Mode.
- Owner or operator abuse or neglect such as: operation without adequate coolant or lubricants; overfueling; overspeeding; lack of maintenance to lubricating, cooling or air intake systems; late servicing and maintenance; improper storage, starting, warm-up, run-in or shutdown practices, or for progressive damage resulting from a defective shutdown or warning device.
- Damage to parts, fixtures, housings, attachments and accessory items that are not part of the generating set.

This limited warranty does not cover costs resulting from:

- Difficulty in gaining access to the Product.
- Repair of cosmetic damage to enclosures.

Please contact your local Cummins Power Generation® Distributor for clarification concerning these limitations.

CUMMINS POWER GENERATION® RIGHT TO FAILED COMPONENTS:

Failed components claimed under warranty remain the property of Cummins Power Generation®. Cummins Power Generation® has the right to reclaim any failed component that has been replaced under warranty.

Extended Warranty:

Cummins Power Generation® offers several levels of Extended Warranty Coverage. Please contact your local Cummins Power Generation ® Distributor for details.

www.cumminspower.com

THE WARRANTIES SET FORTH HEREIN ARE THE SOLE WARRANTIES MADE BY CUMMINS POWER GENERATION ® IN REGARD TO THE PRODUCT. CUMMINS POWER GENERATION® MAKES NO OTHER WARRANTIES, EXPRESS OR IMPLIED, OR OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE.

IN NO EVENT IS CUMMINS POWER GENERATION® LIABLE FOR INCIDENTAL OR CONSEQUENTIAL DAMAGES.

This limited warranty shall be enforced to the maximum extent permitted by applicable law. This limited warranty gives the owner specific rights that may vary from state to state or from jurisdiction to jurisdiction.

Product Model Number: _____

Product Serial Number: _____

Date in Service: _____

Notes:

Cummins